The
Electrical Review

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What E.D.A. is Doing

So many questions have been asked and so many statements and misstatements have gained currency recently regarding the intentions of the Electrical Development Association during the autumn and winter months that it is a relief to be able to place before our readers some things that have taken actual shape or have been definitely decided upon.

The Association, since its reorganisation, has not, as some have imagined, suffered overwhelmingly from an increase of its financial resources. It has, however, made gratifying headway in this respect, and, though it cannot afford to plunge into all those wonderful expansion schemes that have been thought to come within its programme of legitimate operations, it is now in a position to strike out in new and important directions without neglecting any of its present activities.

First, it is enlarging the personnel of its organisation in several very commendable ways. Understaffed and overworked for want of money, the E.D.A. of the past had to leave many things undone that it ought to have done. Additions that are now to be made include new experts on electric heating, electrical installations and building construction, and so on, who will be available at headquarters, and possibly elsewhere, as required by member-undertakings to whom their assistance is likely to be of service.

An assistant business manager is to be appointed—he has been sorely needed for years—and before long probably a power man and a statistical expert will also be engaged. It hardly requires words from us to show how these things will inevitably work out to the advantage of members, especially the smaller undertakings who may not be carrying specialised experts of their own.

We have high anticipations of the great advantage that will accrue to the industry from this change, which will leave the executive chairman and the director (Mr. Cramb) greater freedom for devoting attention to the initiating and directing of classes of work falling within their own peculiar specialised provinces. These changes should materially strengthen the organisation for the great work that lies awaiting it.

The second new undertaking upon which the Association is now embarking is its National Film Campaign (November, 1934, to December, 1935), the chief features of which are published on page 449. By the time these lines are in print every member-undertaking of the Association will have received the official publications in which the scheme is described and the extremely moderate terms upon which local displays can be given are stated. Here we need do no more than bespeak for this very substantial propaganda effort the most cordial co-operation from E.D.A. members everywhere. It is upon such co-operation that its success depends.

It uses a means which is doubtless the most popular with the public everywhere to-day, for the purpose of telling the electrical story. If the people can be induced to listen to the electrical talkie they cannot help becoming electrically minded.

We would urge all authorities to go into the matter at once, make their arrangements with local organisations, and lose no time in fixing up bookings so as to begin operations well before gas propagandists can get into the field along similar lines.

The Benevolent Association

We have received a letter from Mr. Justus Eck, honorary secretary of the Electrical Industries Benevolent Association, in which he refers to the various activities of the organisation which it is appropriate to stress at the beginning of what, electrically considered, is the indoor season. The event of the winter is, of course, the Ball. It is to take place on November 22nd, and we are justified in expecting that under the presidency of Lord Ashfield this and other events of the Association will establish new records. We gather from Mr. Eck that the Ball will "be enhanced this year by a surprise that will please

all present ''; being a surprise it would be tactless of us to say what it is to be. The red membership cards were due, on October 1st, to be replaced in their frames by green ones. The Fletcher penny collection plates which have already done such valuable work will, we hope, be in evidence at many an electrical function during the coming weeks and months. We appeal to all our readers to keep E.I.B.A. interests well in mind; there is no more deserving charity connected with the industry.

Publicity

One of the speakers at the Sheffield gas producers' conference urged others engaged with him in the ghastly business to spend more money and effort upon intense propaganda. He had heard or read somewhere that the electricity supply industry was about to launch a publicity campaign at a cost of £100,000. We wish it were true—but no such luck! E.D.A. will do something, of course, and companies and municipalities who prefer to go on their own will spend a good deal of money on local advertising during the next six months or so. The newspaper Press in the Metropolitan area has been remarkably free from both electrical and gas publicity recently, though some very useful work has been apparent in the provincial Press, and it is hoped that separate undertakings will show greater activity of this kind.

Manufacturers and E.D.A.

It will be recalled that when the reorganisation took place the manufacturing, contracting and wholesaler members retired; but it was part of the scheme to set up a co-operation committee to ensure that the support of the manufacturers so freely rendered in earlier days might be continued in some form. The manufacturers' committee was recently set up, and it will meet quarterly under the chairmanship of Sir William Ray. Its purpose, as officially described, is: "To ensure close co-operation between E.D.A. and representative manufacturing sections of the electrical industry in extending the use of electricity in Great Britain and Northern Ireland." Representatives are now being appointed for the Wholesalers' and Contractors' Co-operation Committee.

A1 at Lloyd's

The new rules regarding the electric propulsion of vessels issued by Lloyd's Register of Shipping may appear to be somewhat rigorous, but we believe that the high standard required will be welcomed by British electrical manufacturers. Mr. A. Regnauld discusses the main features of the rules in this issue. A smaller, but still important, point is a reference to batteries, which should have uses apart from emergency lighting and steering. Thus, the *Acklam Cross*, the first Diesel-electric tug in this country, was the first boat in the world to use a battery instead of compressed air for starting the main engines by motoring the generators. Larger batteries than have generally been used hitherto will, we believe, form part of the equipment of an increasing number of vessels.

Independent Advice

Less appears to be known to the public of the work and status of consulting engineers than of other professional men. While we have always supported the view that consulting engineers should not advertise individually, we have deprecated the way in which they have hitherto hid their corporate light under a bushel. The Association of Consulting Engineers has at last broken through its reserve to the extent of publishing a little book containing notes upon the professional duties of its members, their relations with clients, and general information on fees. The case for the engagement of expert opinion that is independent of manufacturing and contracting considerations is set out in a dignified and convincing manner. There should be a large field for consulting engineers in industrial electrification, and it ought not to be regarded as any more derogatory for a works electrical engineer to seek outside advice regarding such matters as extensions or in negotiating agreements with supply authorities than it is for a doctor to recommend calling in a specialist.

Can and Will

In his first public speech as an Electricity Commissioner, Mr. J. M. Kennedy gave some useful hints to women propagandists at the E.A.W. Speakers' Course Dinner. Loosely worded statements were, he said, of no use, and lecturers must know not only the elementary facts about the practical applications of electricity but also the pros and cons of other ways of performing domestic services, with especial reference to cost. The saying "Electricity is expensive" was applied originally to lighting, and originated, we suspect, partly in a wish of early consumers to acquire an easy reputation for opulence. Nevertheless, we do not envy the speakers their task of trying to explain why price and voltage vary so remarkably in different areas, and in their efforts to secure the general adoption of a new way of doing familiar things they need the assistance of a cost incentive. Mrs. D. W. Newman put this point concisely in saying that electricity must be supplied at a price at which everybody not only can, but will, use it.

Library Facilities

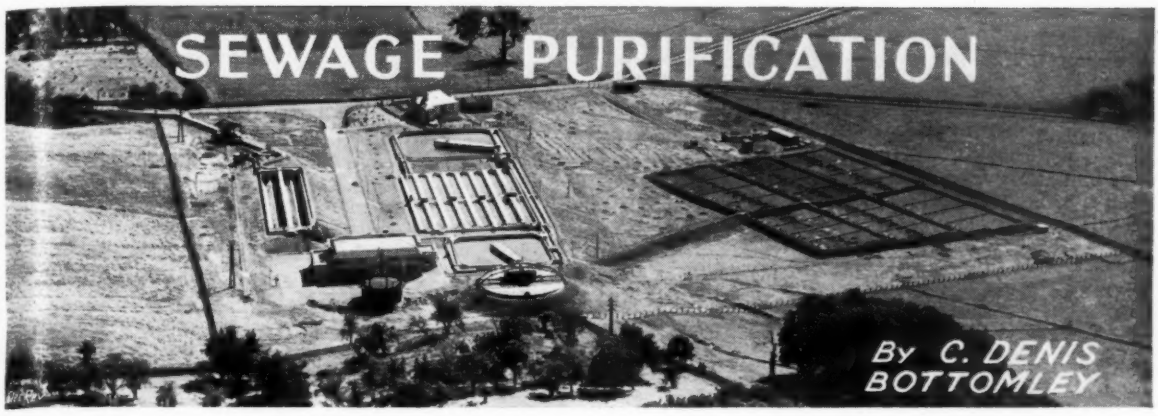
The North-Eastern Centre of the Institution of Electrical Engineers has an arrangement with Armstrong College, Newcastle-on-Tyne, under which books may be borrowed from the College Library. In a circular regarding this privilege, Mr. H. B. Poynder, the hon. secretary of the Centre, also points out that a volume at a time may be taken out of the Institution library in London; in this case the Institution bears the cost of the outward postage and the reader the return postage. This is a long-established custom, but we have found so many members unaware of it that we believe an occasional reminder of this kind will be useful, especially to those in the Provinces.

Swimming Pools

The increasing popularity of open-air inland bathing has emphasised the difficulty of keeping warm water free from green growths. Chlorine (in conjunction with filtration and coagulation) is often ineffective unless an excessive quantity is used. A report recently appeared in the *Lancet* of a test made of the electro-katadyn silver method of sterilisation which was installed four months ago at "The Gay Adventure" restaurant near Esher. This process was described in our issue of September 7th in connection with an installation at the Roehampton Club. The report states that since the adoption of the new system the water has been clear and colourless, and confervoid growths have given no more trouble. Samples of the water, which is heated to 75 deg. F., taken from the cascade, the surface at the deepest part, and the entry to the purification plant were found to contain very few organisms, and were regarded by the bacteriologist as satisfactory.

Radium and X-Rays

The limited supply of radium for the treatment of cancer has for some time caused concern, but Mme. Curie-Joliot would appear, according to a report in the *Daily Telegraph*, to have discovered means to increase the amount available. Meantime, the use of X-rays at 750,000 V and upwards is providing another and better alternative to the surgeon's knife, the dread of which is so great an obstacle to treatment in the early stages of the disease, which is essential. The difficulty in providing high-voltage X-rays in the past was the ability to obtain and retain a high-vacuum in the tubes without the use of joints that could not readily be broken, but the chemist has now come to our aid in the preparation of a grease that makes practicable a simple airtight joint that can be broken and remade as required.



RECENTLY there has been evolved in this country a technique in sewage treatment which, whilst speeding up the process time, has resulted in the mechanisation of the plant to a degree hitherto unknown. This technique is illustrated in one of its most up-to-date forms at the new Carbarns Disposal Works of the burgh of Motherwell and Wishaw, where the plant is claimed to be the most modern and wholly mechanised in the British Isles. It is also completely electrified and entirely self-contained, with its own generating equipment working on the process by-products.

Two noteworthy features of the installation, which has been designed to deal with a d.w.f. of two million gallons of sewage per day, are the compact nature of the equipment and the small size of the driving motors demanded by the various units, as is seen in the accompanying schedule of powers and ratings.

Drive.	Duty.	H.P.	Motor Speed.
Bar screen	Intermittent	1	950
Detritor collector	Continuous	2	1,440
Detritor rake	Intermittent	3½	950
Organic impeller	Intermittent	½	600
Primary clarifier	Continuous	3	950
Barnes pump	Intermittent	5	965
Barnes pump	Standby	5	965
Duplex aerator	Continuous	6	950
Duplex aerator	Continuous	6	950
Duplex aerator	Continuous	6	950
Simplex aerator	Continuous	3	950
Simplex aerator	Continuous	3	950
Reavell blower	Continuous	32	2,850
Reavell blower	Standby	32	2,850
Secondary clarifier	Continuous	3	950
Sludge pump	Continuous	5	475
Sludge pump	Standby	5	475
Hydrant pump	Intermittent	1	1,440
Digester	Continuous	3	950
Hot water pump	Continuous	1	1,440
Hot water pump	Standby	1	1,440
Boiler fan	Intermittent	½	1,420
Sump pump	Intermittent	2	1,450

The Screens

A motor-driven raking mechanism, normally under the control of float-operated switchgear, automatically removes stones and sticks, &c., from the vertical screen bars. The float mechanism consists of two fescolised copper floats each suspended with counterweights by galvanised steel wires over separate pulleys and mounted approximately 18 in. apart in separate chambers connected to the sewage channel, one before and one after the screen. Across the two wire ropes, rising vertically from the floats, is attached a suitably mounted mercury switch arranged so that any rise or fall of the liquid level on both sides of the screen does not affect its horizontal position. A rise in level on one side but not on the other, as happens when the screen has become choked, results in the immediate tilting of the switch, thus completing the pilot circuit for the motor starting gear.

When in its normal "at rest" position, the rake mechanism holds open a limit switch electrically in parallel with the float gear. Once started, therefore, the motor continues to operate until two conditions are satisfied; namely, that the floats have resumed their normal position, indicating that the screen is clear, and that the rake mechanism has completed its travel over the screen and reached its starting point.

Special motor starting and alarm gear is mounted adjacent to the screen, and the panel is surmounted by two indicating lamps in inverted well-glass fittings, and an alarm horn, while on the front of the panel is an "automatic" or "hand" snap switch giving hand control if desired for testing out purposes or continuous running.

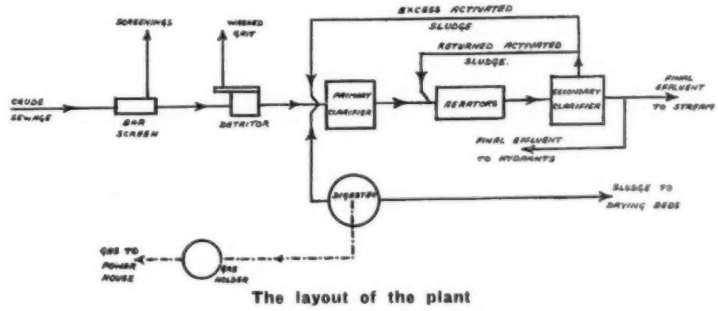
Practical experience at other installations proves that the screen may be presented with the most surprising types of debris, such as a large mass of abattoir offal. Under such abnormal circumstances, therefore, it may become necessary instantly to stop the driving motor, and immediate response to any exceptional mechanical load is ensured by the inclusion of instantaneously operating coil-wound overloads adjustable by hand between the limits of no load and 50 per cent. overload motor current. To obviate the functioning of these during the motor starting period a triple-pole contactor, with a 5-sec. timing relay, short-circuits the overload coils on all three phases each time the motor is started, and during this period protection against electrical fault conditions is afforded by the main fuses.

After coarse screening the removal of inert solid material such as grit, sand or ashes, is accomplished by a Dorr detritor. Raking arms, revolving around a vertical central column from which they are suspended, continuously scoop away the deposited grit and transfer it from the settling tank to a separate compartment. Here an ingenious arrangement of motor-driven reciprocating rakes, constituting the washing and discharging mechanism, delivers the grit in a clean, washed and drained condition.

Sedimentation of the residue is carried on continuously in a primary clarification tank, in which the major proportion of the remaining solids (the sludge) is settled out. This sludge is continuously removed as deposited by raking arms as with the grit in the detritor. Power for the traction drive unit is carried underground, in each case, up to a set of sliprings mounted at the top of the central columns, and from here power and alarm cables are run to the motor along the horizontal truss connecting the drive unit to the arms.

Trailed behind the driving unit is the underspeed alarm device mounted on a single wheel. This consists of a small totally enclosed paddle working in a mercury bath, and at normal speeds it maintains continuity of circuit between a pair of electrodes in a 12-V earthed alarm system fed by a step down transformer in the main control panel.

Weatherproof automatic starting and alarm gear is mounted alongside the track. In addition to the starting contactor, normally controlled by "start" and "stop" push buttons, the panel contains relays for the protection of the motor and mechanism against overload and underspeed and, as in the case of the bar screen, it is surmounted by indicating lights and a horn. In the events of a shut down due to overload instantaneous warning is given, and should the speed of the clarifier fall below normal the same warning is given. If within two minutes normal speed is regained the indicating and alarm relays are automatically reset, otherwise the motor is cut out of circuit.



The layout of the plant

When the sludge has been separated there remains the supernatant liquor which still contains small quantities of organic matter in suspension. This is activated in five aera-

tion tanks each 150 ft. long. Compressed air, supplied from the power house, is injected through porous tiles laid the full length of the tanks, and during aeration the liquid is given a spiral motion by a series of submerged horizontal paddles motor driven at a speed of 5 r.p.m. through worm, spur and final chain gearing. Contactor starting gear for this group of five machines is mounted at the side of the tanks, but each motor is provided with a local reversing and emergency isolating switch.

Sludge from the secondary clarifier is dealt with by two Drysdale vertical spindle slow-speed pumping units driven by weathertight motors. These are located at one corner of the clarification tank, and at the same point is mounted a three-stage Worthington Simpson pump supplying final effluent to the hydrants at a pressure of 24 lb. per sq. in. for sluicing and general cleaning purposes at various parts of the plant.

The sludge from the primary clarifier and the excess activated sludge from the secondary tank are pumped into a totally enclosed gas collection type of digester tank and there maintained at a constant temperature of 80 deg. F. A motor drives the mechanism through spur, chain and final worm gearing. Direct indication of the load on the raking arms is shown by a pointer mechanically operated from the worm shaft of the final drive, and this also operates a switch controlling alarm circuits and the motor itself on overload. The gas evolved during digestion is stored in a gasholder and used as required for two gas engines.

The engines by the National Gas & Oil Engine Co., Ltd., Ashton-under-Lyne, each comprise a four-cylinder vertical convertible Diesel oil/sewage gas unit, running at 500 r.p.m. and capable of developing continuously day and night 120 b.h.p. on Diesel oil and 108 on sewage gas. The convertible type of engine was decided upon as, for the first month or so after treatment of the sewage is commenced, gas is not available.

Driven by each engine is a direct-coupled Lancashire Dynamo revolving field alternator of 87.5 kVA capacity arranged for parallel running and for feeding the three-phase, four-wire distributing system at a pressure of 400/440 V. In addition to the usual exciter a booster exciter is fitted to each alternator ensuring an extraordinarily rapid response to the automatic voltage regulator at sudden changes of load.

An endeavour has been made to obtain flickerless lighting although a 32-b.h.p. squirrel-cage motor is liable to be started up on a single alternator; it is noteworthy that full load can be thrown " off " or " on " to one alternator and the momentary voltage variation as indicated on the switchboard meters is not more than about 10 per cent.

The main power house switchboard is built up of six dead-front sheet-steel panels with flush mounting instruments throughout. Two panels control alternators (one is blank for future extensions), another accommodates the automatic voltage regulator, and two control between them two power and one lighting feeder circuits.

In addition to the usual metering instruments and synchronising equipment, &c., all feeders are controlled by oil-immersed circuit-breakers, and above each switch is a flush-mounted indicating lamp at about normal eye level. Out of sight behind the second feeder panel is a powerful Klaxon horn under the control of the self-resetting relay, which in turn is in series with the four warning horns on the special control panels at the screens, clarifiers and digester. Simultaneous alarm, therefore, is given in the power house of any abnormal condition at any of the four vital points on the external plant.

A large indicator board mounted above the main switch panels shows a single line diagram of all circuits to motors. Each motor on the system is represented by a flush red lamp interconnected with the machine it represents, and only illuminated during the time the motor is actually in operation.

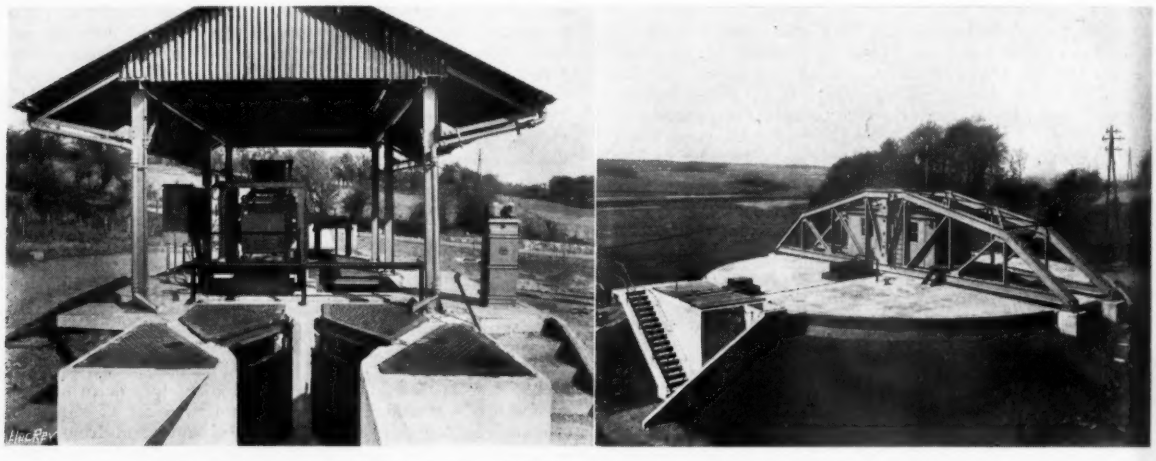
Besides the generating equipment the power house accommodates a number of the treatment plant auxiliaries, including two motor-driven sludge pumps, two motor-driven centrifugal pumps for circulating the hot water through the digester coils, and also two 32 b.h.p. 2,900 r.p.m. high torque motors driving Reavell air compressors, each handling approximately 750 cu. ft. of air against 5½ lb. per sq. in pressure for the aeration process. The starters for this group of motors comprise four hand-operated direct-on switches and two auto-transformer starters built up in the form of an ironclad switchboard.

A heat exchanger can be connected in the engine exhaust system, to work in conjunction with the oil-fired boiler, for heating the digester circulating water.

The Distribution System

Distribution is carried out underground, and all power feeders and pilot wires for the indicating and alarm systems are paper or rubber covered, lead sheathed cables drawn into G.P.O.-type earthenware conduit. Junction boxes are mounted in suitable brick-lined pits with pavement-type manhole covers, and where it has been found necessary to run cables underground in steel conduits between motors and starters, &c., cab tyre sheathed-type cables have been adopted.

Except the seven motors installed in the power house all machines are controlled by a push button or float-operated " direct on " contactor gear, mounted in floor fixing sheet-steel panels of entirely weatherproof construction. Each panel is fitted with a main hand-operated isolating switch and a space heater, while isolating links are provided for each motor circuit in multi-power panels.



Left: Bar screen with control panel and float gear housing. Right: Gas collection digester tank

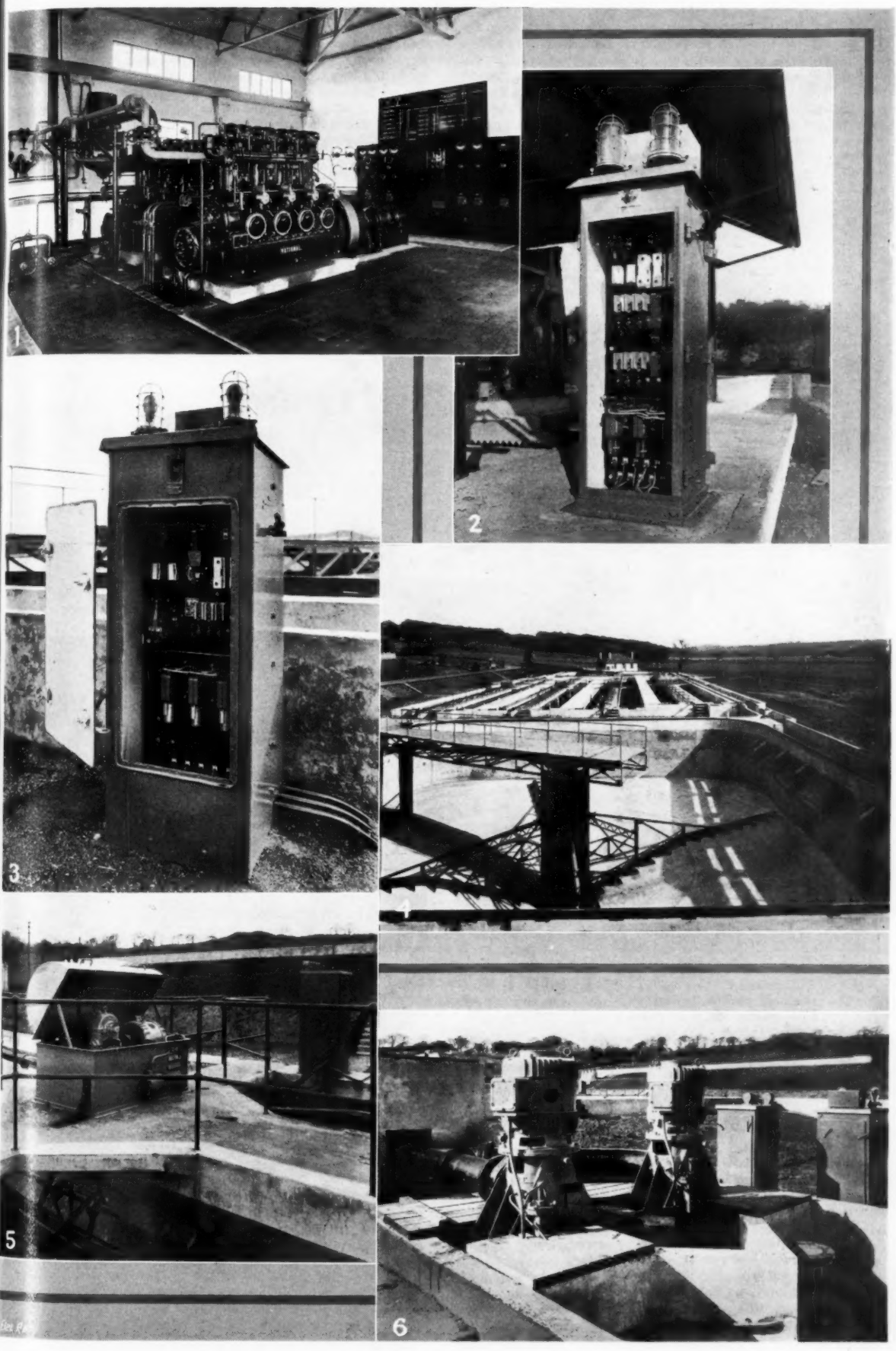
All motors on the system are squirrel-cage rotor induction type ball and roller bearing machines; they total 129 rated horsepower, and, with the exception of the two 32 b.h.p. blower motors, are of the totally enclosed type. In the majority of cases protection from the weather is provided, but " gasworks " weatherproof construction has been adopted where no such protection exists.

Besides the motor load, the whole of the interior and exterior lighting is supplied by the generating equipment. In addition to the usual lighting points the access road is illuminated by five standards fitted with 100-W gas-filled lamps in weatherproof lanterns, and the screens, storm tanks, digester, clarifiers and aerators are all flood lighted by 500-W 16 in. diameter projectors fitted with special diffuser lenses to give as even an illumination as possible over the desired area.

The offices and chemists' laboratory form part of the power house building, but they are separated from the generating house by glass partitions. From these offices the treatment plant can be surveyed through the windows in one direction and in the other a full view is obtained of the indicator diagram on the main power house switchboard.

The complete electrification of the plant has been carried out by Lancashire Dynamo & Crypto, Ltd., as sub-contractors to Messrs. Dorr-Oliver Co., Ltd., London. The special alarm and motor control panels were built to the design of the Dorr-Oliver engineers by the Watford Electric & Manufacturing Co., Ltd., while all standard motor starters are by Allen West & Co., Ltd., Brighton. The main power house switchboard is by Erskine, Heap & Co., Ltd., Broughton, Manchester.

Acknowledgments are due to the Dorr-Oliver Co., Ltd., Lancashire Dynamo & Crypto, Ltd., and Mr. L. Costley, burgh engineer, for their assistance in the preparation of this article.



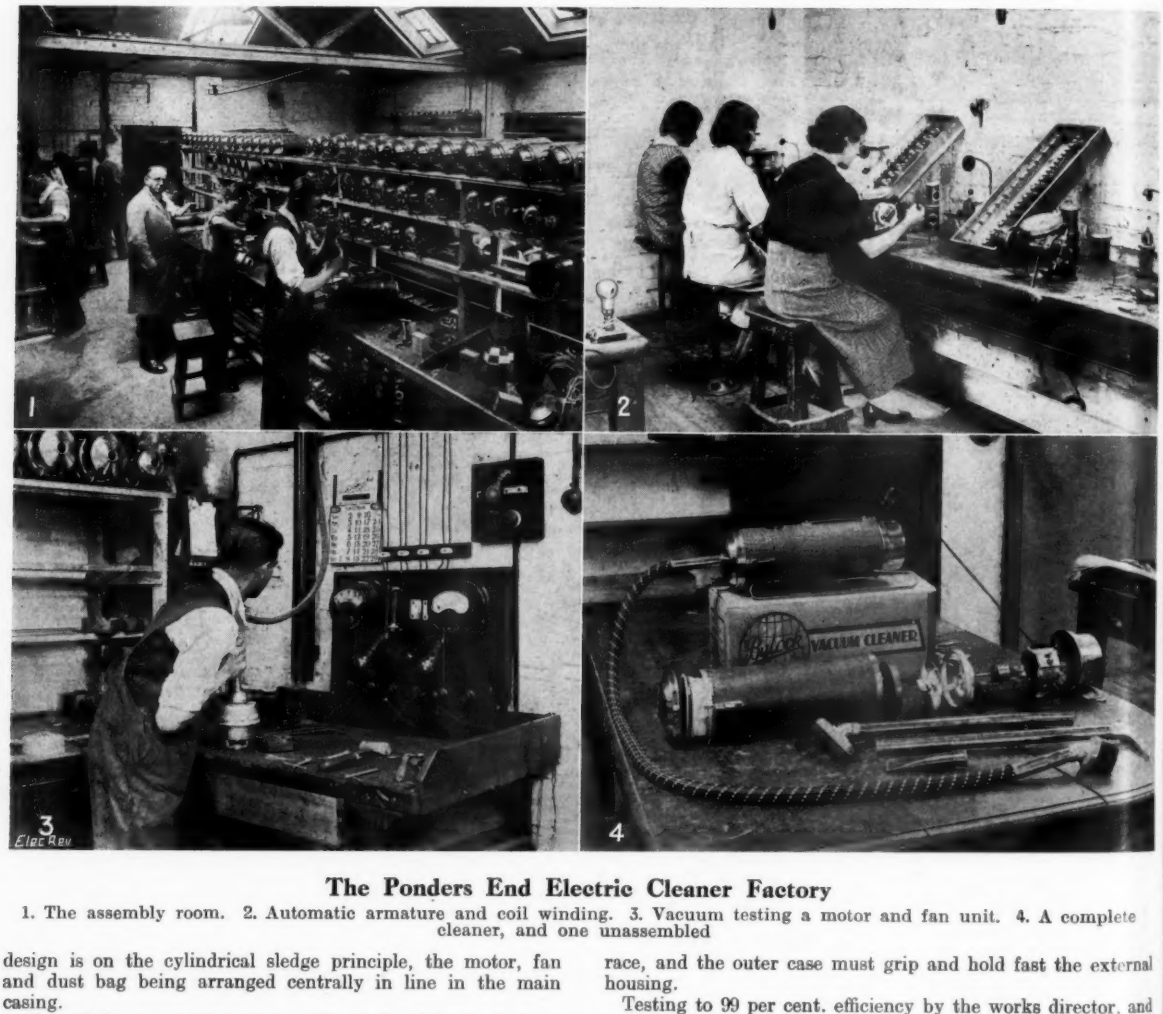
Electrical Plant at a Scottish Sewage Farm. **(See preceding pages)**

1. Gas engine sets and switchboard in the power house. 2. Weatherproof bar screen control and alarm panels. 3. Traction, clarifier control and alarm panel. 4. Primary clarification tank (empty). 5. Duplex aerator paddle drive with five-motor control panel in the background. 6. Weatherproof vertical sludge pump motors

Electric Cleaner Production

MANY things interested us recently when watching the various stages of production of electric cleaners at the Ponders End works of Bylock Electric, Ltd. We deliberately avoid using the word "vacuum" for the company pays a good deal more attention to air displacement. As Mr. P. Doering, works director, remarked, air flow is all-important as a carrier of the dust particles. A Bylock machine, for which a vacuum test of 20 in. was indicated, when used as a blower upset a cardboard box placed in line with it at the delivery end at double the maximum distance at which another machine with a vacuum of 35 in. treated the box in the same way.

The two cleaners produced by the concern, de luxe and ordinary, are designed for vacuum and air displacement figures of 22 in. and 38 cu. ft., and 20 in. and 30 cu. ft. respectively. The consumption figures are 220 W and 200 W. Apart from size and finish the machines are practically identical. The



The Ponders End Electric Cleaner Factory

1. The assembly room. 2. Automatic armature and coil winding. 3. Vacuum testing a motor and fan unit. 4. A complete cleaner, and one unassembled

design is on the cylindrical sledge principle, the motor, fan and dust bag being arranged centrally in line in the main casing.

Most of the components are actually produced in the factory, even to the castings; indeed, it is nearly a self-contained production job. In the foundry the motor bodies and bridges, fan components and metal accessories, are diecast from a special sea-air and sea-water resisting aluminium alloy melted in modern oil-fired furnaces. The cast motor parts are machined to 2/1,000th in. limits.

The stator and armature laminations are produced by combination tools on Bliss presses, armature laminations mounted on high-grade steel spindles by hand presses, and stator laminations assembled on specially designed jigs and riveted together by hand-operated electrical riveting machines. Stator frames are received and equipped with their field coils by automatic winding machines, leaving them ready for mounting in the motor body, and the armature cores first have their winding slots lined with a specially tested insulating material, after which they receive their windings on automatic machines which ensure complete accuracy after being set for the number of turns required for a given voltage. The company regards as important its policy of first training the automatic machine operators to proficiency on hand winders.

Commutators are machine-pressed on to the armature spindles after the winding operations, and it was noticed that after the coil ends were inserted in the segment slots and before they were soldered, a girl burred over the inner edges of the slot on to the wire. The perpendicular electric soldering iron over the cradled armature and commutator is foot-operated downward each time a segment is turned to the required position directly under the iron point.

Insulating-varnish dipping and stoving are operations to which much attention is given before the armature is passed to the grinding shops where the lamination faces, the commutator and the ball-race spindle are ground to dead limits on special automatic machines. Mr. J. T. Rankin, managing director, who acted as guide, stressed the importance of accurate grinding, because of its relationship to noise in operation. The secret of silent running, he said, was not to distort either the inner or outer casing of the ball race. The armature spindle must grip and hold fast the internal case and the race, and the outer case must grip and hold fast the external housing.

Testing to 99 per cent. efficiency by the works director, and expert balancing on knife-edge rails, completes the actual armature building. The completed stator is pressed under jig control into the motor body; the armature is placed in the bridge which is screwed to the body; and, after a preliminary test, the fan is mounted on the spindle and the fan casing is secured, thus completing the motor unit, apart from a two-hours' heat test at 300 deg. C.

The cleaner body is manufactured from "flatted" sheet-steel which is cut to dead size and pierced with holes for fixing the handle, slides, clips, &c., in one operation, under jig control. About fifty sheets at one time are so treated. Cylindrical form is given to the sheet in rollers, and the two edges are butt welded. Freedom from body air leakage is important, and the company believes from experience that the only way to attain this absolutely is by hand welding the edge by the oxy-acetylene method.

An internal motor-anchorage ring is welded to the inside of the cylinder before the latter is covered with leather, cloth or cellulose material. Nickel-plated rings are clipped over each end of the covered body, and the sledges, clips and handles are secured by screws and nuts at the registered holes. A soft rubber ring on a flange of the motor body is pushed home to

Electric Propulsion of Ships. By A. Regnauld, B.Sc.

New rules issued by Lloyd's Register of Shipping

THE requirements governing the design, construction and installation of marine machinery are far more stringent than those relating to similar equipment on land. These requirements are laid down by the classification societies and must be fulfilled to the satisfaction of the surveyors appointed by the Society if the certificate of classification, without which a ship cannot put to sea, is to be obtained.

For the majority of British ships, and, indeed, of the ships of other countries, this classification society is Lloyd's Register, and in view of the growing importance of electricity for the propulsion of ships it is appropriate that the premier classification society should lead the way in the production of rules for this application. These rules have just been issued (Lloyd's Register of Shipping, 71, Fenchurch Street, London, E.C.3; price 5s. net). In forty-seven large pages they deal with both a.c. and d.c. systems, while, since references are made to the ships' auxiliary circuits, the rules for electrical equipment for purposes other than electric propulsion are also included. Any electrical machinery manufacturing firm which hopes to obtain a share of this increasingly important market must work in accordance with these rules.

Mr. A. Regnauld, B.Sc., A.R.C.Sc., M.I.E.E.

To a certain extent, the requirements do not differ substantially from those already fulfilled in the production of high-class equipment for use on land, but in view of the peculiar circumstances governing the operation and maintenance of the equipment of a ship additional rules are obviously needed.

Supervised Construction

The whole of the electrical machinery must be constructed under special survey, and in order to facilitate inspection the plans of the machinery, control gear, cables and electric circuits must be submitted for approval. Further, Lloyd's surveyors will examine the materials and workmanship from the commencement of the work until the final test has been satisfactorily carried out under full-power working conditions.

When steam turbines are employed for driving the main generators the governors must be so designed that if the rated load is thrown off the maximum variation of speed shall not be sufficient to bring the emergency governor into operation, and the permanent variation of speed shall not exceed 4 per cent. of the rated speed.

In addition, when the propeller speed is varied by controlling the engine speed, as is usual, the control gear must be so sensitive that it will permit increments and decrements of speed not exceeding 1 per cent. over the range of 50 to 100 per cent. of the maximum speed. Somewhat similar conditions are imposed for oil-engine driven generators, and it is further laid down in this case that, when coupled to its generator, the combined set must not run at anything close to a critical speed at any designed running speed.

The ordinary requirements of the generators and motors are largely dictated by the necessity of avoiding the effects of moisture, sea air and oil vapour, these being the permanent bugbears of the marine engineer. All windings must be insulated and treated to resist their effects, and mica or micanite must be used to insulate the windings from the frame. If it is desired to use other types of insulation particulars regarding the behaviour, properties and life of the proposed materials must be submitted.

Ventilation also receives special consideration, provision being made to avoid as far as possible the intake of moist or oil-vapour laden air. All generators of 500 kW and over, and motors of 500 s.h.p. and over, must be provided with efficient means for heating the windings, either electrically or otherwise, to prevent condensation when idle. In view of the importance of maintaining what is termed "manœuvrability," systems dependent upon the auxiliary generators for excitation are to be capable of manœuvring and maintaining power at all times with a fall of 10 per cent. in the excitation voltage at the bus-bars. It is recommended that for large equipments alternative means of excitation should be provided.

Maximum Permissible Voltage

In view of the greater risk of earthing on ships, due to the steel construction of the foundations and partitions, the question of maximum permissible voltages receives careful attention. With a.c. systems, for equipments of not more than 15,000 s.h.p. per shaft (this has not been exceeded in any British ship to date, although the French liner *Normandie* will be above it) the voltage under normal working conditions must not exceed 3,500 between lines and 2,020 to earth.

The ratings and limits of permissible temperature rise must conform to values given in the tables included in the rules; generators of 5,000 kVA and over, and motors of 5,000 s.h.p. and over, having an axial arc length of 1 metre or more, must have at least three embedded temperature detectors and a temperature-indicating instrument. With d.c. systems the maximum voltage to earth at any part of the equipment is 600 and of any single armature 1,000, but proposals involving higher voltages may be submitted for consideration. The ratings and permissible temperature rises must also conform to values tabulated in the rules.

A number of stringent rules have been framed to cover the general construction, position of installation, operation, &c., of the control gear. Suitable interlocks, preferably mechanical, must be provided to prevent damage by improper operation, such as the opening of switches or contactors not intended to be operated while carrying current.

Provision must be made for the manual operation, with reasonable effort, of all manœuvring contactors, switches, field regulators or controllers without solenoids or other electric, pneumatic or hydraulic aids. If such aids are used for normal operation, then failure of the extraneous source of power must not result in the interruption of power to the propeller-shaft, and the control gear must be capable of purely mechanical operation without delay in changing over to manual control. This does not apply to equipment for controlling the propulsion motors from the bridge of the ship.

Instruments, protective gear, earth detectors and temperature alarms are also dealt with in detail with a view to adding to the safety of the equipment and the operating staff. Finally, cables and conductors are the subject of rigid rules, not only as regards size and rating, but also relating to insulation, protective covering and the positions in which they are to be laid.

Every attempt has been made in the new rules to ensure efficiency and reliability in the electrical equipment employed. While it may be suggested that some of the conditions imposed are rather too onerous, it must not be forgotten that the classification 100 A1 at Lloyd's has always represented the hall-mark of excellence, to such an extent, indeed, that the expression is frequently borrowed for use in general conversation to signify any condition approaching perfection.

Cleaner Production (*continued from previous page*)

the anchorage ring, and fixing of the motor unit is by rubber bushings over trunnions on the body, so that the motor is well insulated from the case.

The nickel-plated head and dust-bag cover at the ends of the cylinder are spun from sheet-brass, as is also the fan wind cap. Cables and plugs are supplied to the company to exacting specifications, and all plated parts are first well coppered. The completed machine is tested running under artificial heat conditions for two hours.

Fixing armature leads in commutator segments

Signalling in Mines. By G. A. Cutler

The copper oxide rectifier as a safety device

THE common use in coal mines of signalling systems in which the external circuit consists of uninsulated conductors has the advantage of simplicity, for the signals can be given from any point of the system by touching the two conductors together. In any mine in which firedamp is a hazard the use of a signalling bell or relay may involve the production of incendive sparks, either at the instrument or on the external circuit, if the design of the bell or relay does not include a means of suppressing the induced voltage which is caused by breaking the circuit during the act of signalling.

A suitable means for suppressing this induced voltage was investigated by Dr. R. V. Wheeler* and subsequently by Dr. Wheeler and Prof. W. M. Thornton,† who found that it was possible to make safe such circuits by providing the magnet bobbins of the bell or relay with a copper sleeve, a short-circuited winding or a non-inductive shunt. Bells and relays fitted with such devices have for the last twenty years been tested and certified by the Mines Department as safe against the ignition of firedamp at a voltage not exceeding 25 V; that is, the maximum voltage permitted by the Regulations for signalling purposes.

It was found that the inclusion of such devices involves loss of operating efficiency and in order to overcome this disadvantage experiments were made at the Mines Department Testing Station, Sheffield, of the effect of using a copper oxide rectifier as a safety device.

Spark Quenching

The use of a metal rectifier as a spark quenching device in place of a condenser is suggested in a descriptive pamphlet (No. 11) issued by the Westinghouse Brake and Saxby Signal Co., Ltd.

The usual type of safety device possesses the disadvantage that the electro-magnetic circuit can be made more efficient only at the expense of safety, for any attempt to increase the electro-magnetic efficiency is usually counteracted by the necessity to proportion the safety device so that the bell or relay is safe; the extent to which the system as a whole can be made safe and more efficient is, therefore, limited.

The copper oxide rectifier may be applied so as to offer a low impedance to the discharge of the energy stored in the electro-magnet when the circuit is broken, and a high impedance to the normal working current when the circuit is closed for signalling.

A bell or relay fitted with a copper oxide rectifier as a safety device should, therefore, be more efficient than one fitted with a low resistance shunt or other usual safety device, all of which reduce the signalling efficiency of the electro-magnet system when the circuit is closed.

Results of Experiments

Experiments were made to show whether a copper oxide rectifier could safely be used as an alternative means for suppressing incendive sparking under the conditions of the official test of bells and relays.

In these experiments one or more discs of a small Westinghouse rectifier were connected across the winding of the bell or relay. The experiments were to determine the minimum voltage and current required to ignite at the break-flash an explosive mixture of firedamp and air when the safety device was (*a*) removed, (*b*) as certified by the Mines Department, and (*c*) consisted of a copper oxide rectifier.

The method of determining these igniting currents and voltages was that used in the official Mines Department test as described by Capt. C. B. Platt and Dr. R. A. Bailey.‡ The following results were obtained:—

(1) *Bell A*, 50 ohms, safety device 500 ohm shunt.

	Min. Igniting Voltage.	Min. Igniting Current.
Bell with no shunt	6.0 V.	0.12 A.
Bell with 500 ohm shunt	26.0 V.	0.57 A.
Bell with Westinghouse rectifier (1 disc R.G.C.3 unit)	58.0 V.	1.15 A.

(2) *Bell B*, 30 ohms, safety device 100 ohm shunt.

	Min. Igniting Voltage.	Min. Igniting Current.
Bell with no shunt	4.0 V.	0.11 A.
Bell with 100 ohm shunt	34.0 V.	1.45 A.
Bell with Westinghouse rectifier (1 disc R.G.C.3 unit)	50.0 V.	1.66 A.

(3) *Relay C*, 100 ohms, safety device 500 ohm shunt.

	Min. Igniting Voltage.	Min. Igniting Current.
Relay with no shunt	8.0 V.	0.08 A.
Relay with 500 ohm shunt	52.0 V.	0.55 A.
Relay with Westinghouse rectifier (1 disc R.G.C.3 unit)	65.0 V.	0.65 A.

Further experiments were made using discs from a Type L.T.4 Westinghouse rectifier, this being a smaller and cheaper type than the R.G.C. type previously tested.

	Min. Igniting Voltage.	Min. Igniting Current.
(4) *Bell A*, with Westinghouse rectifier (1 disc L.T.4 type)	57 V.	1.12 A.
(5) *Bell A*, with Westinghouse rectifier (2 discs in series L.T.4 type)	53 V.	1.05 A.

When the direction of the current was reversed, the rectifier in experiment (4) being connected across the bell terminals, no ignition was obtained at 26 V and 4 A with 6.5 ohms added resistance in circuit. The maximum current on short circuit delivered by a 25 V Leclanché battery of the type certified by the Mines Department for use on bare wire signalling systems is approximately 2.5 A.

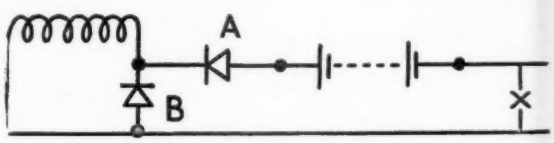
The operating efficiency of a bell or relay fitted with a metal rectifier safety device was observed to be nearly the same as that of the unshunted instrument, while the factor of safety was increased.

It follows that the use of a rectifier as a safety device would enable bells and relays to be designed to operate with greater efficiency, while still complying with the official requirements as to safety.

The rectifier unit is small in size and can be conveniently fitted to existing designs of bells or relays; the dimensions of the type R.G.C.3 disc are diameter 1⅛ in. and thickness ¼ in., and those of the L.T.4 type disc are diameter ⅝ in. and thickness $\frac{3}{16}$ in.

A bell or relay fitted with a rectifier safety device can readily be tested with a view to seeing whether it is in working order, the resistance in one direction being the resistance of the coils and in the reverse direction very low, less than one ohm. This difference is more readily observed than the smaller change in resistance obtained when the shunt is disconnected.

It is necessary to connect the rectifier with correct polarity with respect to the battery, otherwise the bell or relay would not operate. To prevent a heavy discharge of the battery



A safeguard against reversed polarity

should the connection be incorrect, a second rectifier disc can be connected between the magnet winding and the line; the second disc should be connected in opposite polarity to the safety disc, as shown in the accompanying figure.

The connections are such that the working current is passed by rectifier A and not by rectifier B. When the line current is interrupted the energy stored in the bell or relay winding is discharged through rectifier A, while energy is prevented from passing out to the line by rectifier B. If the bell or relay were incorrectly connected with respect to the polarity of the battery, rectifier A would offer a high resistance to the flow of current.

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* Report on Battery Bell Signalling Systems [so far as regards the Danger of Ignition of Firedamp-Air Mixtures by the Break Flash at the Signal Wires], by R. V. Wheeler, D.Sc., 1915. (H.M. Stationery Office, 2d.)

† Report on Electric Signalling with Bare Wires [so far as regards the Danger of Ignition of Inflammable Gaseous Mixtures by the Break Flash at the Signal Wires], by R. V. Wheeler, D.Sc., and Prof. W. M. Thornton, D.Sc., D.Eng., 1916. (H.M. Stationery Office, 2d.)

‡ Report on an Investigation at the Mines Department Testing Station of the Safety of Certified Mine Signalling Bells when connected in Parallel, by Captain C. B. Platt, M.B.E., and R. A. Bailey, Ph.D., 1928. (H.M. Stationery Office, 6d.)

A "Coiled Coiled" Lamp in a Lighthouse

The Westschouwen Lighthouse at Haamstede, Holland, was recently equipped with electric lamps of a new type which provide a beam of ten million candle-power, making this beacon one of the most powerful in Europe. The lamps used in this lighthouse were specially designed by Philips in collaboration with Mr. van Braam van Vloten. The new lamp is spherical in shape and about a foot in diameter; its filament consists of a double spiral of tungsten, which makes possible a maximum luminous intensity with a lamp of minimum size. The special beacon is designed for a pressure of 70 V and a current of 60 A. Owing to the efficiency of the new lighthouse, which emits twelve powerful beams, it has been possible to put the lightship *Schouwenbank* out of commission.

A Hotel Laundry

ADVANTAGE has been taken of the opportunity presented by the recent enlargement of the Regent Palace Hotel, to which about 160 new bedrooms have been added, to remodel entirely the laundry. This laundry serves, not only the Regent Palace Hotel, but also the Strand Palace Hotel, the Royal Palace Hotel, and the Cumberland Hotel. It is capable normally of dealing with some 75,000 items per week, consisting mostly of hotel visitors' clothes, together with some table and bed linen and staff uniforms.

Considering that the work is carried out in the heart of a large building at Piccadilly Circus, the atmosphere within the premises is remarkably clean and free from vapour. The maintenance of an equitable temperature is assisted by motor-driven ventilating plant installed by the Carrier Engineering Co., Ltd., which furnishes fresh air through a viscous oil filter of the continuous type and, at the same time, extracts by exhaustion through a system of ducts all steam and hot water vapour that may escape from the machines. General artificial illumination is provided by about sixty 100-W Benjamin metal reflector fittings suspended from the ceiling, all lamps over machines being enclosed in watertight glass bowls.

A feature of the organisation is the intricacy of the sorting and marking for identification of the incoming soiled linen. Checking, marking, and sorting are carried out with the aid of moving belt conveyors, driven by fractional-h.p. Lancashire Dynamo and Crypto motors, classification being according to the type and grade of garment to facilitate washing in bulk. This equipment, including steel booths and bins, was made by Messrs. A. & C. Jenner, Ltd.

Three horizontal cylinder washing machines are installed in line, steam heated and driven by geared motors. Two of them are of the cascade variety by the British Laundry Machinery Co., Ltd., the third being an "Ibis" machine by Messrs. Isaac Braithwaite & Son (Engineers), Ltd., with a "Metrovick" motor. Having been washed, the clothes are transferred to an adjacent parallel row of three electrically driven centrifugal dehydrators made by the British Laundry Manufacturing Co., and Messrs. Watson, Laidlaw & Co., Ltd., which extract the bulk of the water before the garments are placed in the Carrier hot-air drying rooms.

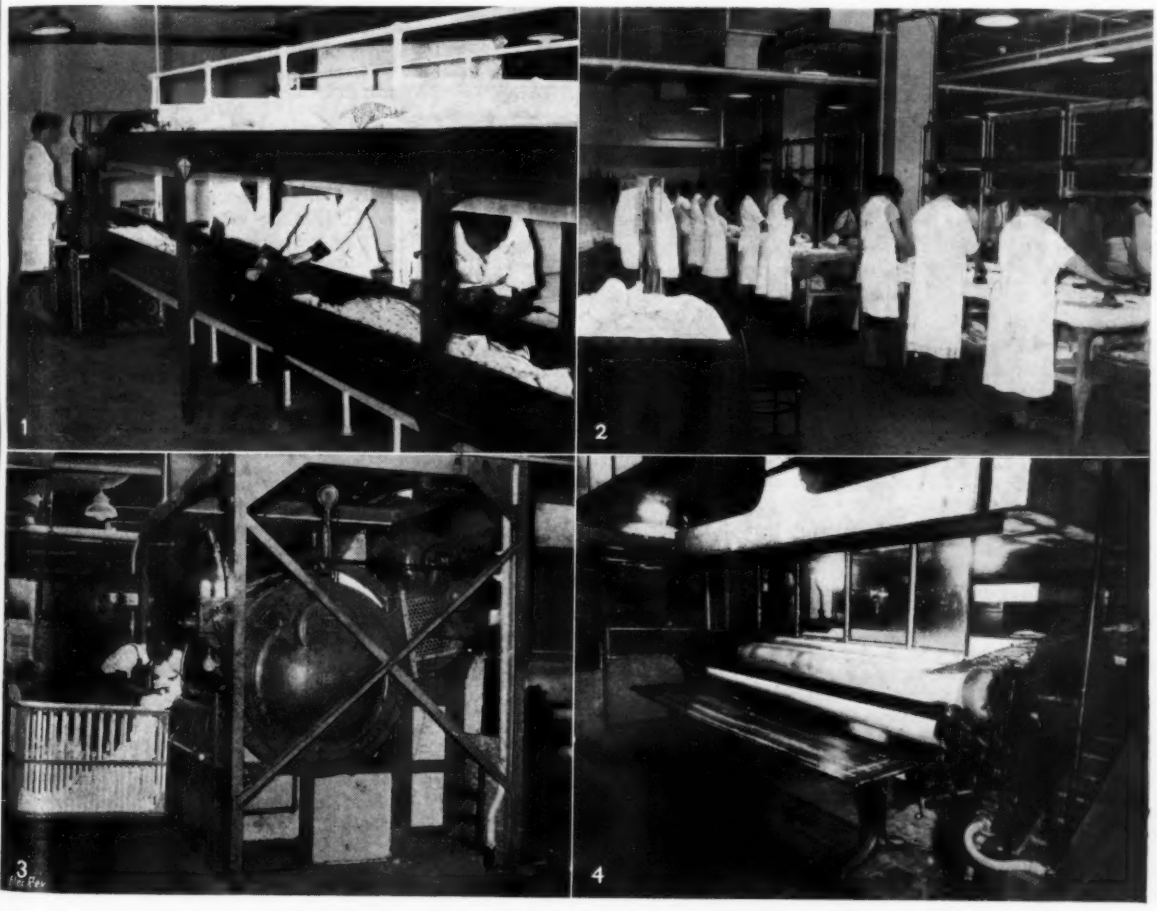
Bath sheets, bath mats and bath towels are not dried and ironed in the ordinary way, which would cause the long nap to dry stiff and rough. Accordingly such articles are treated in a horizontal-drum Braithwaite tumbler. The driving motor with its automatic drum reversing controller periodically changes the direction of rotation in order to prevent the contents being pressed into a solid mass by centrifugal force. At the same time a motor-driven fan incorporated in the machine injects air into the cylinder in such a way as to blow the fibre-ends of the material outward and so restore the soft surface. Fluff produced during this process is removed from the machine by the Carrier extraction plant.

Flat table and bed linen is dried and ironed simultaneously by the single operation of passing it through a four-roll British Laundry Machinery Co. calender, which is motor driven and has heated chests. Forced draught absorbs the moist steam that is given off and removes it through a canopy over the machine. Similarly, curtains are dried on a large stretching frame through which hot air is blown.

Besides two Hall shirt and collar finishing machines, there is a battery of large "Gladirons" made by Messrs. Lister Bros. These are moved to and fro along the ironing board, which is several feet in length, by means of a belt drive actuated by a fractional-h.p. motor, of which there are nineteen in all. In addition some forty-eight "Sunco" 500-W electric irons are arranged along double-sided tables for hand finishing wearing apparel. Each iron is connected to a separate plug-socket with its own fuse and tumbler switch, while a sub-main switch has been installed to open all three phases of the whole of the ironing section as an extra precaution against individual irons being inadvertently left on.

The motors employed in the laundry proper aggregate 65 h.p., with an additional 85 h.p. elsewhere in the building for driving ventilators, a push-button-operated Marryat & Scott passenger lift, a Penrose service lift, and other auxiliaries.

During the extension of the hotel premises the old plant had to be removed and the new laundry re-equipped without materially interfering with the normal output. The installation work was carried out by the staff of the company, who used Walsall conduit, Dennis fuseboards, Hackbridge cables, and Pirelli-G.E.C. armoured cables. Electricity is purchased from the St. James' and Pall Mall Electric Light Co., Ltd., at 400/230 V, three phase, 50 cycles, controlled by Whipp and Bourne switchgear of the central bus-bar metal-clad pattern.



The Laundry at the Regent Palace Hotel

1. Motor-driven sorting and classifying conveyors. 2. Portion of the electric ironing section. 3. Motor-driven tumbler with forced draught. 4. Four-row ironing calender

Static Balancers. By R. M. W. Grant, B.Sc.

Results with cut and solid neutrals

THE purpose of a static balancer in an a.c. system may be to make a neutral available when the neutral line is not included in the system, or to improve the regulation of the more heavily loaded lines. For the second purpose the question arises as to the relative merits of cut and solid neutrals, including the modification of the former in which a choke coil is connected in the neutral between the supply and the balancer.

Identical results can be obtained with either a cut or a solid neutral. It is merely a matter of suitably designing the question arises as to the relative merits of cut and solid balancer there is no reason why the neutral conductor should not be used to full advantage. The "choke-neutral" method of connection seems to be an attempt to produce a cut-neutral effect while preserving continuity, but I have seen no convincing demonstration, either theoretical or experimental, that the use of such a choke coil can confer any advantage. The calculated results shown in the accompanying tables are in accordance with figures obtained on test.

Mr. R. M. W. Grant—a personal note appears on page 461

A complete mathematical analysis of the problem of the loading of a static balancer necessarily involves the method of symmetrical components. The results are given here in a simplified form; the simplifications consist in neglecting the effect of the magnetising current, iron loss, and reactance of the balancer and the reactance of the line.

Let m be the number of lines (excluding the neutral), R_L the resistance of each line, R_N the resistance of the neutral

PHASE "A" LOADED TO 30 A.

	Four wire distribution.	Balancer. With cut neutral.	Balancer. With solid neutral.	Balancer. With choke neutral.
V_A	218	221.2	223	221.5
V_B	233	231.4	230.5	231.8
V_C	233	231.4	230.5	230.7
I_B	—	10	6.25	9.53
I_N	30	—	11.25	4.41
Voltage between neutrals ...	6	4.8	2.25	4.50

(which may include the effect of a choke by adding "jX"). R_B the resistance per phase of the balancer, E_A the line-to-neutral voltage of phase A at the sub-station, V_A the line-to-neutral voltage of phase A at the balancer, I_a the line current of phase A on the load side of the balancer, and $\Sigma_1^m I$ the vector sum of the load currents, *i.e.*, the out-of-balance current. Then

$$V_A = E_A - R_L I_a - \left[\frac{mR_BR_N - R_L(R_L+mR_N)}{R_L+mR_N+R_B}\right]\frac{1}{m}\sum_1^m I$$

and

$$I_B = \frac{R_L+mR_N}{R_L+mR_N+R_B}\quad\frac{1}{m}\sum_1^m I$$

It should be noted that this expression cannot, in general, be used directly to calculate the phase-to-neutral voltages even with unity power factor loads, because the phase relationships of the currents must be known in addition to their magnitudes. In the general case the loads must be expressed as impedances and the resulting currents calculated. If the currents are known both in magnitude and phase, the expression may be used directly. Thus, for example, with one phase only loaded, there is no difficulty in determining the magnitude and phase of the current.

The most important fact revealed by the above expression for the voltage drop is that the third term on the right hand side, which is the same for all phases, can be made zero by designing the balancer so that

$$R_B = \frac{R_L(R_L+mR_N)}{mR_N}$$

This condition makes the voltage drop on any phase independent of the loads on the other phases and would seem to be the ideal condition, although it may not always be practicable on account of cost.

To make a comparison between cut and solid neutral operation, if independent regulation of the phases is aimed at,

(i) cut neutral, $R_B = R_L$ and $I_B = \frac{1}{m}\sum_1^m I$

(ii) solid neutral, i.e., $R_N = R_L$

$$R_B = \frac{m+1}{m}R_L \text{ and } I_B = \frac{1}{m+1}\sum_1^m I$$

The balancer for solid-neutral operation has a higher resistance and is designed for a smaller current. Supposing that a balancer with resistance R_B is to be operated with a cut neutral and one with resistance R_B^1 with a solid neutral, then identical results will be obtained when

$$R_B^1 = \frac{R_L+mR_N}{R_L+mR_N-R_B}R_B$$

The cut-neutral balancer would be designed for a current per phase of

$$I_B^1 = \frac{R_L+mR_N-R_B}{R_L+mR_N}I_B$$

If R_B is greater than (R_L+mR_N) the cut-neutral balancer is useless, because better results can be obtained with solid neutral and no balancer. On the other hand, with solid neutral, the balancer will always assist matters whatever its resistance may be.

An Example

As an example of the foregoing let us consider a balancer designed for use on a three-phase four-wire system has a resistance per phase of 0.48 ohm, and is to be installed at the end of 800 yd. of 0.1 sq. in. four-core cable to deal with 30-A out-of-balance current. The line-to-neutral pressure is 230 V. For the length of cable considered R_L and R_N are each 0.2 ohm and two conditions of loading have been considered, first, 30 A on phase A alone, and secondly, 30 A on phases A and B. Both conditions give 30 A out-of-balance, but the phase of the current is different. There are four possible ways of supplying the load, namely, four-wire distribution without a balancer, balancer with solid neutral, balancer with cut neutral, balancer with the neutral connected through a choke coil the reactance of which has been taken as 1 ohm.

The results of the calculations are given in the tables, which show that the results obtained with the choke are, roughly, intermediate between those obtained with cut and solid neutrals. The reactance of the choke was chosen quite arbitrarily, but even with a much larger value the results would not differ much from those given, for the voltage across the choke, *i.e.*, 4.41 V, is not much short of the maximum possible, 4.8 V.

It is easy to verify from the formulæ given that the results tabulated for a cut neutral could be obtained with a solid neutral with a balancer having a resistance of 1.2 ohms per phase and carrying a current of 4 A per phase, *i.e.*, with a neutral wire current of 18 A. Also, a balancer having a resistance of 0.2 ohm per phase with cut neutral, or one with a resistance of 0.267 ohm per phase with solid neutral and designed to 7½ A per phase would give a 6 V drop on any

PHASES "A" AND "B" LOADED TO 30 A.

	Four wire distribution.	Balancer. With cut neutral.	Balancer. With solid neutral.	Balancer. With choke neutral.
V_A	221	222.6	223.5	222.2
V_B	221	222.6	223.5	223.3
V_C	236	232.8	231	232.5
I_B	—	10	6.25	9.53
I_N	30	—	11.25	4.41
Voltage between neutrals ...	6	4.8	2.25	4.50

one phase for a load of 30 A on that phase irrespective of the loads on the other phases. As the balancer considered gives 7 V drop when used with solid neutral, it is doubtful whether the expense of a lower resistance balancer is worth while.

I.E.E. Students' Quarterly Journal

The Students' Quarterly Journal, which appears in September, December, March and June of each year, is issued free of charge to students and graduates under 28, but other members, of any class, of the Institution of Electrical Engineers may obtain it on payment of an annual subscription of six shillings, which should be sent to the secretary of the Institution. The charge to non-members is ten shillings per annum.

Earth Leakage Protection. By T. C. Gilbert, A.M.I.E.E.

An explanation of its principles

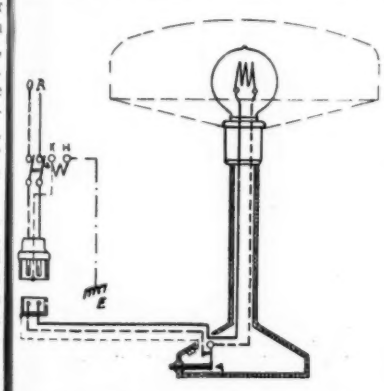
EARTH leakage protection by means of special low-current trip switches, sometimes called automatic safety switching or artificial earthing, is referred to in the tenth edition of the I.E.E. Regulations. Recent criticisms, especially in letters to the technical Press, have shown a lack of knowledge of the system and its applications, probably because reliable information has been difficult to obtain.

The view that the fundamental principle of the system is the limitation of earth leakage currents to a small value so that persons or animals coming within the sphere of such currents can pass them unharmed is wide of the mark, as the limitation of earth fault currents in circuits of any capacity to from 25 to 30 mA is only incidental.

The object of the system is to limit leakage potentials upon protected apparatus, which no other form of earth leakage protection ensures. While current magnitude must be considered where high earthing resistances are encountered, the important point is the limitation of leakage potentials to a harmless value.

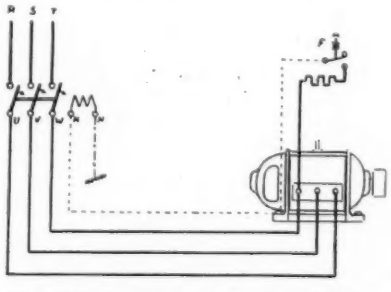
Foreign Experience

In countries where earth leakage switches are in common use, the highest permissible leakage potential (immediately preceding the isolation of faulty apparatus or circuits) is considered to be about 40 V. In Germany, for instance, for all approved mechanisms the switch must trip with a potential not exceeding 24 V with a resistance of 200 ohms in the artificial earth circuit and 42 V with 500 ohms. This resistance in the earth circuit is additional to any resistance or impedance of the operating coil itself. Provided the switches function within the voltage limits mentioned, then the manufacturers have a free hand as regards current. There is no reason why the current should not be as high as 1 A, except that this would increase dependence upon the earth electrode, which it is desired to eliminate as far as possible. The current could be reduced to 1 mA, but this, although reducing dependence upon the earth electrode to almost vanishing point, would imply a very fine winding for the trip coil with liability to burn-out and breakage. Experience shows that reliable operation can be secured with 20 to 30 mA without unduly increasing dependence upon the earth electrode, a resistance of 500 ohms being possible in the earth circuit without raising the leakage potential beyond the safe limit.



A lamp with a test key from the metal standard to earth

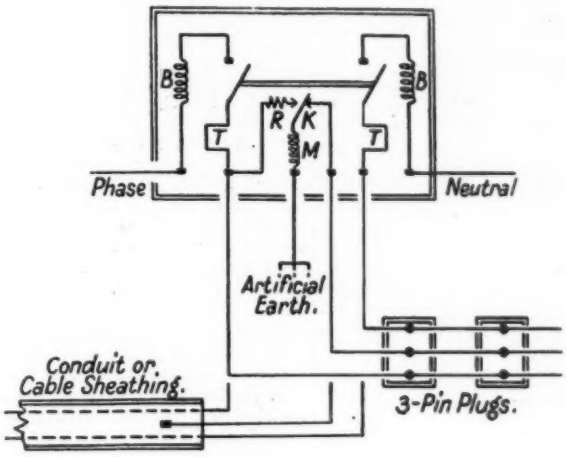
A recent letter to the Press stated that the average impedance of the trip coil was about 8,000 ohms, and rarely below 4,000, but the highest impedance of the many trip coils I have tested was 820 ohms at 50 cycles; the d.c. resistance varied between 40 and 120 ohms, and in all cases the trip coils were robust.



In this case the motor has an extended test key, giving a complete circuit test from motor to earth

A frequent criticism is that although the earth circuit may be easily tested by means of the test key incorporated in the switch, yet the test applies only to the part between the switch and the earth electrode, and does not cover the more vulnerable portion, namely, the flexible cord to the appliance and the plug and socket. Nevertheless, although a test key is placed at the switch position to facilitate a test from this point, a test of the earth circuit need not stop there. It is equally simple to examine the complete earth circuit from the appliance to the electrode; a test can be made at the three-pin plug by simply shorting the phase socket to the earth socket, and from the appliance by shorting the "live" element to the earthed frame without danger to the tester, the appliance, or the automatic switch; on appliances with exposed elements this test is most simple.

In Germany a considerable number of appliances are constructed in which the "off" switch consists of a contact making the connection between phase terminal and frame, the earth line from the appliance to the electrode being under constant test during normal operation. It is unnecessary to interpose resistance between the phase terminal and the earth contact when testing, as the speed of disconnection minimises risk of damage to coil or mechanism.



An automatic switch fitted with overload trips T and magnetic blow-out coils B

The incorrectness of the view that testing by means of the key places an uncontrollable potential upon the casings of apparatus connected to the earth line may be deduced from the diagram of the automatic switch, where the test key K is disconnected from the internal earth circuit before making contact with the phase line through the test resistance R. In most patterns the overload trips and magnetic blow-out coils are omitted, the switch being used purely as a leakage device.

These switches should be installed between the appliances and their overload protection devices, but they are needed only in the sub-circuits supplying the two or three vulnerable points in the average house, namely, the kitchen, the bathroom, and possibly the garage. In hairdressing saloons a group of plugs can be fed through one leakage switch, but this should *not* be placed at the main-switch position or isolation of the lighting system is likely to follow a fault on one appliance.

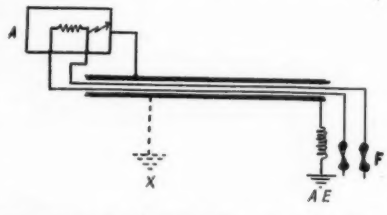
For farm installations an expensive continuous earth system throughout the installation is unnecessary; an inexpensive earth circuit can be provided by means of a small earth spike adjacent to the appliance point. As a two-pole 15-A leakage switch should not cost more than about 12s., this should represent a considerable saving in cost. A leakage potential upon one faulty appliance cannot be extended to other sound appliances, as is possible with one continuous earth circuit throughout the farm.

False Earths

Possibly the most difficult criticism to meet is one which recently appeared in the correspondence columns of a technical paper, that the presence of false earths (*e.g.*, accidental earth contacts between conduits and steel frameworks of buildings and water pipes or between lead sheaths and earthed objects) will vitiate the protection afforded by earth leakage switches, and that the only way to overcome this is to insulate all earth wires and run them in the conduits with the circuit wires. I have myself on occasions suggested that, for ultra-complicated protective systems, a discriminating action can be easily secured by using lightly insulated wires as earth conductors, such as ordinary bell wires, but they are by no means necessary for the ordinary installation.

While a low-resistance earth in parallel with the leakage trip may prevent the operation of that trip, it cannot prevent the fundamental function of the switch nor vitiate its protection. In the diagram showing the effect of a false earth in parallel with the trip, the conduit is earthed through the trip coil of

a leakage switch to the artificial earth AE; at the same time there is an accidental earth at X. Protective fuses are at F. Should the resistance of AE be comparatively high, as this is the selected earth electrode it may be assumed that its resistance will at all times be less than X, but taking the combined resistances of the two at 5 ohms, and the rating of the fuses F as 25 A at 230 V, then it is clear that the circuit will never be isolated by means of the fuses. Current will flow over the two earth connections until sufficient potential appears upon the conduit to operate the trip. This will be anything between 10 and 40 V, depending upon the resistance of AE.



The effect of a false earth in parallel with the trip

With twenty false earths the position remains the same. If false earths prevent the appearance of a potential upon the conduit and appliance, they are bound to isolate the circuit by the fuses and there is no need for the leakage trip to operate; if their combined resistance is too high for this, then a potential must appear and the trip will operate.

Assuming that the resistance of AE is zero and X the same, no potential will appear upon conduit or appliance due to the fault, but in practice there is enough potential at A to enable current to flow to X or AE. Isolation follows by the fuses, and no call is made upon the leakage trip. Any other fault, such as over-fusing or a rise in resistance of the false earths due to heavy current passing over them, must result in the appearance of a potential upon A and the conduit. As the resistance of AE is in this case low, a potential of about 8 to 10 V will be sufficient to secure isolation.

Simple experiments with a few alternative earth paths will prove that, often even with zero resistance at AE, the trip will operate before the fuses blow, because with a very low earthing resistance the potential necessary is also very low. With an increase in resistance of AE and X the operating potential also rises.

The value of the earth-leakage switch is most apparent with high earthing resistance, when accidental earth paths must also be of high resistance. That of the average tubular earth electrode is generally between 50 and 100 ohms, and isolation of a faulty circuit cannot be effected by its fuses. With twenty or a hundred false earths the appearance of the requisite potential upon the protected appliance (with 100 ohms about 16 V) secures immediate isolation by the trip.

I believe that the use of the system will result in a modification of installation technique, and that costs will tend to fall, my main reasons being as follows:—

A heavy-current-carrying continuous earth circuit throughout the installation is unnecessary, as conduits, &c., are required only for mechanical protection. All earth protective circuits will be local and applied only to such points as require them. It will always be easy to add earth protection as required, for such hitherto inadequate earths as hot-water radiators and gas pipes will provide effective earth protection with the light fault currents.

In rural installations the cost of the earth-leakage switch has only to be balanced against the cost of providing an adequate earth under present systems of protection, in which considerable expense may be incurred without success, as times of drought or extreme low temperature completely vitiate the protection afforded.

Longer service may be expected from appliances and portable tools in that they may be earthed without risk of destruction in the event of fault. The lightest apparatus and the heaviest motor are alike isolated by means of a small earth leakage, which is incapable of causing any damage whatever. Maintenance costs become lower for this reason and because earth tests are simple and require no expensive instruments or hours of time, being sometimes automatic during the normal operation of the device.

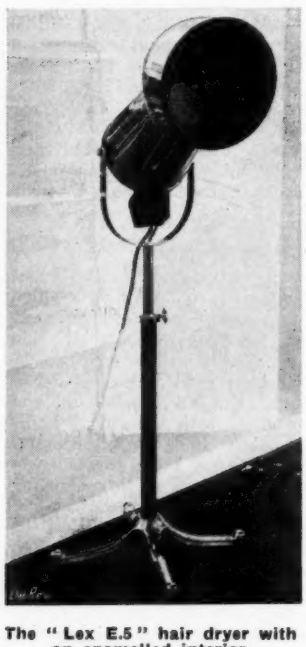
Rural work will certainly become much less costly than at present, and the elimination of the continuous-earth circuit and the costly electrode, with consequent simplification of wiring systems, should result in the wide extension of electrical services to farms, where the avoidance of accidents to cattle and persons will play its part in popularising electricity.

The initiation of the system abroad was due to the trouble experienced in rural installations, owing to the inadequacy of the systems of leakage protection hitherto employed, but its success in rural areas led to its use elsewhere. In several parts of Germany alone the use of earth-leakage switches is now compulsory, following ten years of practical experience in all classes of installations, and it is reasonable to assume that it will equally meet our own needs.

Improved Hairdressing Appliances

A TOUR of the Hairdressing Fair held at Olympia from September 25th to October 4th revealed a number of improvements in the design of the electrical equipment used in this trade, and a definite move towards making the apparatus safer and eliminating risk of shock was noticeable.

I. Calvete, Ltd., 59, North Street, Clapham, S.W.4, have designed their type "H" permanent waving machine so that the heaters are not connected electrically when actually in use. They are first raised to a predetermined temperature which may be one of nine. A red indicator light commences to glow when the temperature has been attained, and the bakelite heaters, which are fitted with plugs, can then be removed from their sockets and used; they are, of course, designed specially to retain the heat.



The "Lex E.5" hair dryer with an enamelled interior

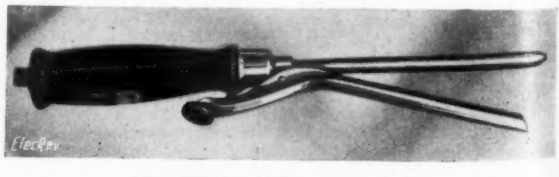
A similar effect is brought about in the Madison appliance (Madison (England), Ltd., 16, Berkeley Square, London), but in this case the twenty heaters are plugged into a stand to which is fitted a regulator which can be set to store enough heat in the heaters to last from one to ten minutes; thus no current flows through the heater when it is in use.

The "Safety Six" perming machine shown on the stands of NAGELES, 8/12, Edward Street, Wardour Street, London, and HOVENDENS, 29/33, Berners Street, London, operates at 6 V. The appliance is designed on standard lines apart from the low working voltage.

The same trend towards safety is noticeable in the new hair dryers. Both the new Calvete "Perfex" and the "Osgar-Chief II" (Osborne, Garrett & Co., Ltd., 51, Frith Street, London, W.1) are fitted with a bakelite lining so that the damp hair cannot touch the metal. The last-mentioned machine embodies several other novel features, including nine variations in the heat control and a specially robust element. The appliance has an external finish of feather-weave enamel. The new "Lex E.5" (Halliwell & Co., Ltd., 48, Lexington Street, Golden Square, London, W.1) has insulating enamel as an internal finish. A good portable setting dryer is the Calvete "Ultra," in which there is an exceptionally large aperture.

A Calvete "Ultra" portable setting dryer

The Westinghouse curling iron, a newcomer to this country, is being sold by L. G. Hawkins & Co., Ltd., 30, Drury Lane, London, W.C.2. It is loaded at 20 W.



The new Hawkins curling iron

Good Industrial Lighting. By J. W. Howell

THE desirable level of illumination for any industry will vary according to the accuracy of the operations involved, but recent developments have made it possible to plan industrial lighting installations with a full knowledge of the results that will be obtained.

Considerable evidence exists to prove beyond doubt that good lighting materially increases output. For example, the Government type-setting report showed that an illumination of 20 ft.-candles was needed to equal daylight working conditions. In addition, the saving effected by increasing the illumination from 2 ft.-candles was sufficient to pay for the extra lighting twenty times over. Further tests under actual working conditions gave the following results :—

Kind of work.	Average f.c. with old system. %	Average f.c. with new system. %	Increase in production with new system. %
Foundry	2.5	7.0	7.5
Jute weaving ...	9.8	21.4	13.2
Roller bearing ...	5.0	20.0	12.5
Silk weaving ...	50.0	100.0	21.0
Tile pressing ...	0.59	14.3	12.8
Wool knitting ...	5.0	50.0	20.0
Tape weaving ...	6.5	12.0	6.0
Jute spinning ...	1.5	9.0	17.0

The cost of a good lighting installation seldom exceeds 2 per cent. of the wages bill—a small amount compared with expenditure on other services.

The introduction of a better lighting system not only normally increases output, but brings about a vast improvement in quality. Minor defects which might otherwise pass unnoticed into the finished product and thus decrease its value are more easily detected and remedied in the initial stages of manufacture.

As a typical example, tests were conducted in the artificial silk industry, in a place where weaving looms were kept under strict control. It was found that, by increasing the lighting nine times and applying it in the correct manner, the increased profits due to improved cloth quality for good class material amounted to no less than £18 per annum per loom. Increased profits through increased output showed a further nine shillings, the total so far outweighing increased overheads and running costs, as to show the handsome net profit of about £16 per loom.

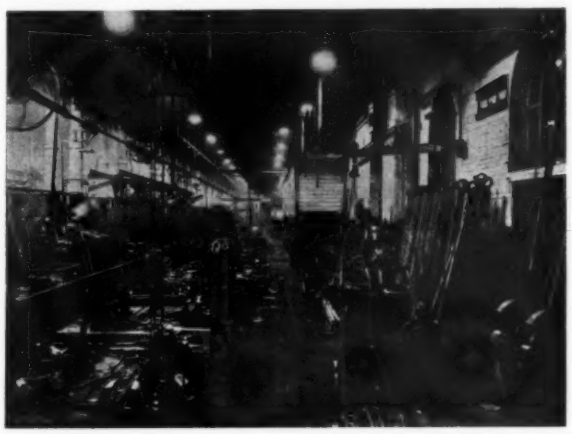
Under similar conditions in the same industry, the warping process showed a net profit of £4 per beam per year with an improved quality of production of 230 per cent.

Reduction of Accidents

The survey of reportable accidents shows that approximately 70 per cent. of these are traceable to falling, but the number could no doubt have been greatly reduced with good lighting. The official figures for 1932 indicate that the 602 deaths and 105,562 reportable accidents on industrial premises cost in compensation approximately £5¾ million. Having regard to the 70 per cent. mentioned, it can be assumed that a burden of over £3 million was thrust on to industry due to defective illumination.

Monetary loss is not the only result; highly skilled labour is constantly being drained and, in some cases, destroyed; in situations where years of training have been thus wasted considerable loss accrues. The most common industrial lighting system in use is the general overhead with dispersive reflectors, and though this is efficient it does not follow that it should be adopted in every case. For example, in the examination of large tin plates and polished steel, a diffused light is essential in order to overcome the difficulties due to specular reflection, and in these cases the industrial diffusing fitting or a fitting employing the same principle is necessary.

In some cases directional lighting using angle reflectors gives the best results, while in others fully corrected lighting proves more beneficial than even daylight in certain colour matching processes. This is due to the value of daylight illumination constantly varying while that of corrected lighting can be maintained constant. Again, where high intensity lighting is required, as for fine fitting and assembly work, it would obviously be uneconomical to provide general illumination of a high character. In this case it is advisable to illuminate by the general system to about six ft.-candles and step up where necessary by correctly controlled local lighting to the intensity required. In explosive or corrosive atmospheres special fittings are required and schemes involving their use should never be embarked upon without expert advice.

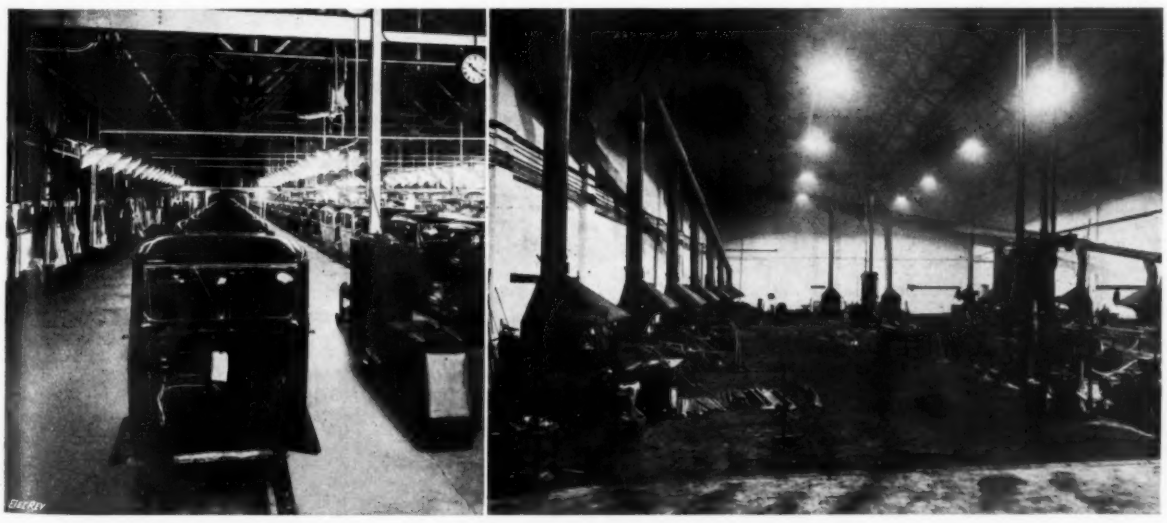


The connecting-rod shop of the G.W.R. in which the lighting is evenly diffused

Cleanse the Fittings

Dust and dirt accumulation reduce the efficiency of a lighting system enormously. In a typical case in an office, standard fittings became so coated with dust after eight weeks that the decrease of light output was 18 per cent. In the majority of works all lamps and fittings should be cleaned regularly at intervals of from four to six weeks with soap and water.

It is estimated that the number of factories is 150,000, of which 30,000 are not electrically lighted. This is in addition to factories in the course of erection, so that about £3½ million is awaiting enterprising contractors. A considerable revenue from increased lighting load also awaits the supply authority. There is every indication that the time is ripe for an intensive campaign to convince industrial executives of the value of good lighting.

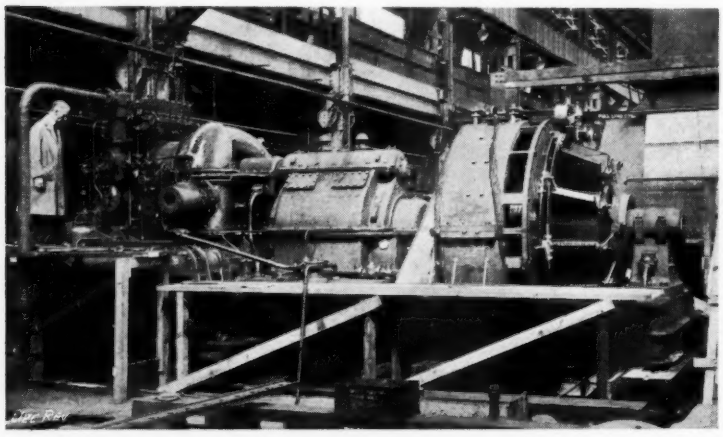


Two examples of modern industrial lighting. The body-finishing shop of the Austin Motor Co., and the smiths' shop at the Liverpool tramway depôt

The New Cunarder

Electrical equipment for the "Queen Mary"

IN our last issue we referred to the remarkable extent to which electricity is to be used on the Cunard-White Star liner *Queen Mary* that was launched on September 26th.



One of the seven 1,300-kW B.T.H. turbo- generator sets photographed at the Rugby works

In addition to the motor-driven auxiliaries to be supplied by four 1,300-kW turbo-generators, the comprehensive "hotel service" calls for the installation of three similar sets. The whole of the 9,100-kW generating plant is of B.T.H. manufacture.

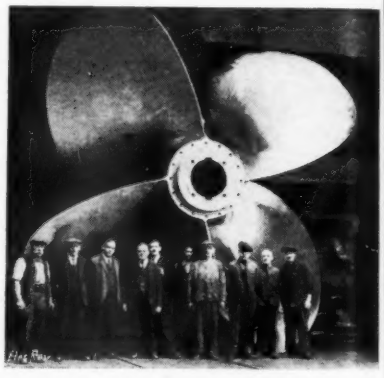
Each of the seven sets comprise a ten-stage 5,000 r.p.m. turbine driving through reduction gearing a 225-V 600 r.p.m. d.c. generator, having an overload capacity of 25 per cent. for two hours and 50 per cent. for five minutes. The condenser is integral with the turbine, which enables the complete unit to be assembled on the one floor level. The stop-valve steam conditions for the main machinery sets are 370 lb. per sq. in. and 680 deg. F., and for the hotel service sets 230 lb. per sq. in. and 650 deg. F. Two B.T.H. 75-kW generators driven by Parsons 850-r.p.m. oil engines are also installed for emergency lighting and other essential duties.

Steam for the first four turbines is taken from the twenty-four Yarrow oil-fired boilers used for propulsion. As the other three sets are required for use when the vessel is in port, three cylindrical boilers have been installed to provide steam for this purpose.

The feeder-cable system which consists of a ring main, a subsidiary main and local distributions is probably the largest and most complete of its kind anywhere. These cables were made and supplied by Callender's Cable & Construction Co., Ltd. In all there will be about 4,000 miles of cables and wiring on this vessel. The arrangements made will, it is said, ensure supplies adequate for emergency in any circumstances.

For catering for the needs of over 3,000 passengers the all-electric kitchen will have to provide for some 12,000 meals per day, and refrigerators as well as cookers, baking ovens and water heaters are to be a feature of the installation. The number of lamps to be wired is said to be 30,000. Eleven lifts will be fitted for use by passengers in all classes, two for hoisting luggage, three for stores, and two for kitchen service.

Ventilation has received especial attention, and will be electrically controlled both generally and also locally to suit individual wishes. For maintaining the supplies of hot and cold water, ten electrically driven pumps of varying sizes will be used, apart from those required for the swimming baths and the sanitary arrangements. Other pumps are required for the seventy-two hydraulic controllable bulk-head doors fitted by Messrs. J. Stone & Co., Ltd., who also provided four of the eight bronze propellers (four spare), the others being manufactured by the Manganese Bronze & Brass Co., Ltd. The bearings are of the Ransome & Marles Bearing Co.'s make. The winches for the lifeboats are spur-driven by 20-h.p. B.T.H slow-speed weather-proof motors with drum-type controllers. There will be twenty-four sets of Taylor gravity davits, each controlled by a double-wire fall from its appropriate winch mounted on the deck house.



One of the "Queen Mary's" propellers, which is 20 ft. in diameter with a pitch of over 18 ft. The weight of the casting is 53 tons, and that of the finished article 35 tons

The rudder will be operated by electro-hydraulic gear supplied by Brown Bros. & Co., Ltd. The communication system will include a tele-autographic service and loud speaking telephones.

A Glasgow Trades School

The official opening of the new Stow College

THE Rt. Hon. Sir Godfrey Collins, K.B.E., C.M.G., Secretary of State for Scotland, formally opened the new Stow College, Shamrock Street, Glasgow, on September 26th, in the presence of a large gathering of educationists and others interested in industrial education.

River-Bailie J. M. Biggar, convener of the Education Committee, who presided, said the building had cost £160,000 and would provide accommodation for 1,000 students nightly. Although the classes had not yet started, over 1,200 names had already been enrolled. The old Stow College had specialised in the printing trades, but the new school would cater more directly for the engineering trades upon which Glasgow relied chiefly for its industry.

Sir Godfrey Collins remarked that, owing to the long slump in the heavy industries, a scarcity of skilled workers might prove a handicap to the district when trade improved. This school would give keen youths an opportunity to learn theory and practice so that when the time came they could seize the chances offered to them. As a Glasgow business man he appreciated fully the work done by schools of this type, which provided facilities for training lads on leaving elementary schools.

Mr. J. B. Whyte, of Messrs. Whyte & Galloway, architects, on behalf of the contractors presented a cheque for £100 to Sir Godfrey Collins, who handed it to the chairman to be used by the authorities as they might consider desirable for advancing the aims and objects of the school.

Sir Charles Cleland moved a vote of thanks to Sir Godfrey Collins and Councillor Rosslyn Mitchell thanked the chairman.

The building is an imposing five-storey structure of red brick on a grey granite base. Built round a centre well lined with white glazed brickwork, the workshops, classrooms and laboratories are well-lighted and present pleasing interiors.

On the ground floor workshops are provided for electric welding, oxy-acetylene welding, patternmakers, sheet-metal workers, vehicle construction, trimmers, painters, and a foundry. On the first floor there are rooms for plumbers and plasterers, art craft and rubber technique (a new trade for Glasgow) and classrooms.

The second floor carries the electrical power units, rooms for heat treatment, engineering workshop fitters and tool rooms, garage apprentice workshop, drawing office, classrooms and a shop for electric wiremen. The third floor is occupied chiefly by classrooms, a large lecture hall, a drawing office and a stores and model room. Laboratories (electrical, chemical, physics and science), a research room, a dark room, a room for cinema operators, a gymnasium and tea-room, are the important features of the fourth floor. The fifth floor will be used chiefly as storage accommodation and is at present unequipped.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Lighting Service

In reply to Mr. Sutherland's letter in your issue of September 28th I see no reason why even a domestic consumer should not have the pleasure of architectural lighting effects in his home if by efficiently combining light and decoration they can be brought within reach of his pocket. Suppose, however, one assumes that certain fittings are suitable only for special buildings; need they even then be inefficient?

I would take as an illustration of my point the vertical coves in the architectural studio. These, I am informed, are lighted by eighty 40-W lamps on 12-in. centres. According to British Standard Specification No. 161 the average output of a 230-V 40-W lamp is 7¼ lumens per watt, so that the total flux available is 24,000 lumens for a power consumption of 3,200 W.

I am convinced by the demonstration to which you were good enough to refer me privately that, using suitable fittings, the same (or better) result could be obtained with ten 200-W lamps giving also 24,000 lumens. (I am ignoring for the moment the number of light groups which would obviously affect the actual substitution, and also the possibility of reducing the light needed by distributing it more efficiently.) One obtains therefore the same light flux, more uniformly distributed, a power consumption of 2,000 W instead of 3,200 W, a lamp cost nearly halved, and one-eighth of the wiring points. That, I submit, is well worth doing if the decorative value is unaltered or improved.

If Mr. Sutherland were planning the structure of a building he would not dream of putting in two tons of steel where one ton would carry the load. Why should we use light less efficiently than structural material? The E.L.M.A. organisation has no doubt done very good work in showing the public that certain effects are possible. It has still to show them that these effects can be obtained at reasonable cost.

October 1st. CONSUMER.

Contractors' and the Commissioners' Regulations

In his article in your last issue Mr. Peake Sexton refers to the term "authorised person" which occurs in Regulation 30 and gives the definition of such a person from the Home Office Regulations. Might I suggest that the correct definition of an "authorised person" under the Commissioners' Regulations is given at the beginning of these Regulations?

London, W.C.2, *October 1st.* HENRY NIMMO.

A Slot-meter Problem

With reference to the letter on this subject in your issue of September 28th I should think "Tenebris" must be a young man in the trade. Several years before the war I had occasion to fix up slot meters of the kind to which he refers in a fairly large town in North Wales. They were of the d.c. electrolytic ampere-hour class.

I forget the name of the meter, but I think it was a Continental make similar in outward appearance to the Bastian electrolytic meter mentioned in Vol. 2 of the 1903 edition of Perren Maycock's "Electric Lighting and Power Distribution." The inside of the meter, so far as I remember, was a glass tube with a graduated scale filled up to zero with a solution of caustic soda or potash, then topped up with paraffin to prevent evaporation.

An aluminium weight was suspended inside on a very fine wire over a pulley. On inserting the coin (I think it was sixpence) and turning the knob the weight was lowered into the solution, thus making contact. When an amount of solution corresponding to the weight was used up another coin had to be inserted, and so on. Should the consumer neglect to put in a coin a carbon-filament lamp fixed inside the meter was put into series with the house circuit, thus dimming the lamps. This dimmer also consumed electrolyte.

Now for the "snags": customers neglected to put in their coins for some time and when reports came to the office complaining of poor lights they used to resent putting in extra coins to make up for what the dimmer and their lamps had consumed before the lighting would return to normal brightness.

I had sometimes to adjust the meter so as not to injure their feelings unduly. I also tried carbon lamps of several different voltages to increase the dimming, but this was unsatisfactory. Afterwards I removed the lamp from the meter and brought about what "Tenebris" has noticed, with the result that the flash sometimes cracked the glass tube or fused the suspended wire holding the weight.

Motor meters would register when using a reactance or resistance, and if that happened for any length of time consumers would object to pay for poor light, as they would call it, in spite of any instructions conveyed to them.

In the days of which I am writing meter fixing, reading, cable jointing and service work were carried out by one man save for a labourer to open the road. TOO OLD AT 55.

September 30th.

Referring to the letter from "Tenebris" in your issue of September 28th, we have for some time been using slot meters manufactured by the Metropolitan-Vickers Electrical Co., Ltd., in which is incorporated a buzzer which warns the householder that the electricity for which prepayment has been made is nearly exhausted, and therefore he should put in another coin at once. ARCH. J. HOWARD.

Taunton, *October 1st.*

The Olympia Proposal Renewed

Your Editorial comments on my letter regarding "Electrolympia" call for some further comment. The heading of your leaderette "A Difficult Matter" is correct, but this phrase was applicable to the initial efforts to establish the Motor Show and Radio Show. It will certainly be no easy matter to obtain unity of effort in the electrical industry to push forward the work for a National Electrical Show. This is a cause which calls for altruistic efforts on the part of the pioneers if it is to succeed.

The reference to the sale of 50,000-kVA sets is the wrong view to adopt towards such a proposal. Such large equipment is not sold at exhibitions, and in any event is not produced in large enough quantities to justify the outlay of showing it running on a stand. It could be represented more easily in model form, in which a complete system could be shown functioning.

The financial profit accruing from such a show could not be assessed from the returns of units sold during the period of the exhibition, but the amount of publicity afforded by the national Press would be valuable propaganda from which sales would accrue for many months afterwards. The fact that even a slight financial loss might be sustained would be more than offset by the publicity obtained for the industry, which definitely would cost many thousands of pounds to obtain by direct advertising.

Memories of Wembley may arise, but that was a long-drawn-out ill-fated effort which was primarily looked upon as entertainment. There are now available statistics of the motor

This parsnip-like object was once like the "Osram" lamp seen above it, but a fire occurred at the Midland factory in which it was installed, with the result that it became considerably elongated. It terminated its long-drawn-out existence by giving a feeble glow when put in circuit, which was not a bad effort after its fiery ordeal

and radio trades to study and weigh up for the potentialities of the proposition, but remembering that whilst both are non-essential trades to the lives of many people electricity is a force that affects the lives of all citizens of our larger towns and cities.

The public will forgive a failure if they can understand the cause, but they are apt to be very resentful of new improvements that they cannot understand and which at times prove vulnerable and fallible. The show should help the timid housewives, who are always so afraid of "shocks," to have full confidence in properly earthed appliances.

The main purpose of "Electrolympia" should not be lost sight of in the discussion. We must make the public "electrically minded," and by means of the show they will study, discuss and inspect the latest equipment. They will then be in a receptive mood to change from old equipment to new with the increasing changes in development. The show would offer an ideal meeting place for the manufacturers, the wholesalers and the contractors and help them to unify their efforts for the season in addition to assisting them with their buying.

Despite the silence that has greeted this matter to date it must be taken up at some time if the trade is to keep its share of the expenditure from the nation's purse. Money spent on cars or radio cannot be reclaimed for purchase of electrical goods, so we must compete with others to keep our annual share of the expenditure as large as possible. Whence shall the first movement come? I still feel that the trade Press can fan the spark into flame. M. C. Toner.

London, S.E.19, *September 30th.*

Recruiting the Men

With reference to the leading article in your issue of September 21st, the decentralisation of industry and its migration into comparatively rural areas has made the technical education of the younger employés somewhat difficult. The small works employing only a few hundred hands and remote from a technical college is not in a position to run its own evening classes. Further, except by a few keen minds, the attendance several evenings per week at classes is not relished even by those who take a genuine interest in their work.

One solution of the problem is the formation of a works technical society run on similar lines to the sports and other social activities. I have been connected for some time with an organisation constituted as a branch of the sports club and open to all members of the firm. An annual subscription of 1s. is paid by all members over eighteen years of age, and this sum covers all administrative expenses and leaves a surplus at the end of the year for the purchase of books for the library.

The activities of the society fall into three classes: visits, lectures, and a library; visits are the most popular.

It may be asked what visits of technical interest can be made in a small town, bearing in mind that any other local factories probably keep the same hours as one's own and that "away" visits must be restricted to one or two per year. The following are some of the places which can be visited:—Electricity works, gas works, laundry, cold storage establishments, dairies, picture houses, water works, bakeries, fire stations and telephone exchanges, all of which have much interest.

Lectures fall into two classes—those given by members themselves and those by outside authorities, the latter being decidedly the most popular. Many large firms have films of their activities available for loan, and several interesting evenings can be devoted to their exhibition. Lectures and demonstrations are invariably of the "popular" variety. Anything of a highly technical nature would interest only a very small number of members. The society can only be successful by interesting every class of member.

The technical library makes a popular link between the lectures and visits. Books are contributed by members themselves, by the firm, and they are also purchased out of any surplus funds. S. F. Philpott, A.M.I.E.E.

Banbury, *September 29th.*

"Entre Nous"

Mr. William F. Jarvis's letter published in your issue of September 28th is interesting, but his argument is possible of contradiction. A salesman of my acquaintance, well-built, of good presence, a good and attractive talker, and well trained (in fact, so much of an engineer as to be asked for his opinion and advice on all sorts of difficult problems, by public men getting at least three times his emoluments), tells me (with all his natural, and acquired, gifts and accomplishments) that he cannot make any headway whatever with particular Corporations and large industrial buyers, who purchase mainly from one source. This is in spite of the fact that the same equipment can be purchased from twenty or more manufacturers, some of whom specialise in a particular class of equipment which is better than that turned out by their competitors.

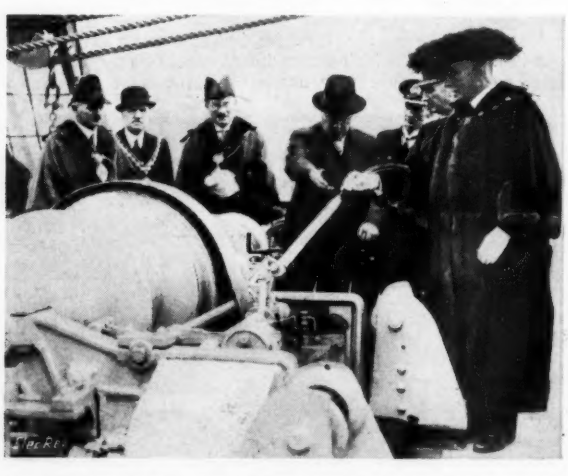
Why don't electricity committees and directors ask *why* all these eggs come from one basket? Vide ut supra.

October 1st.

The "National Telephone Week"

The ceremonies arranged to take place throughout the country in furtherance of the "National Telephone Week" were inaugurated on Monday with a visit of inspection which Sir Kynaston Studd, Acting Lord Mayor of London, accompanied by the Postmaster-General (Sir Kingsley Wood) and others paid to H.M. C. S. *Monarch* in the Pool of London.

This small yacht-like vessel, one of the two cable-laying ships employed under the direction of the Post Office, is engaged wholly in the laying and repair of submarine cables operated by the Post Office around the coasts of Britain. The steamer has three cable tanks and is fully equipped for the maintenance and testing of under-water sea and river cables of all types. She does not go far beyond home waters, larger vessels being needed to deal with deep sea cables.



Sir Kingsley Wood, the Postmaster-General, explains to Sir Kynaston Studd, Acting Lord Mayor of London, the operation of the gear aboard the cable ship "Monarch"

The Acting Lord Mayor expressed his pleasure in taking part in the inauguration of "Telephone Week," and congratulated the Postmaster-General on the introduction of new and reduced telephone tariffs.

In reply, Sir Kingsley Wood said they desired to make the telephone more than ever an essential and efficient part of the national system of communications, and hoped that by the considerable reductions which came into force on October 1st they had made it possible during the week to enrol a record number of new telephone subscribers.

Forthcoming Legal Actions

The following legal cases which have an electrical interest have been set down to be heard in the Royal Courts of Justice during the present Michaelmas sittings, which commenced on October 2nd and end on December 21st next:—

In the Court of Appeal.—Mullard Radio Valve Co., Ltd., *v.* Philco Radio and Television Corporation of Great Britain, Ltd., on the appeal of the plaintiffs from the judgment of Mr. Justice Farwell in the Chancery Division dated July 3rd, 1934.

Companies' Court (before Mr. Justice Eve).—Petition in *re* Flactophone Wireless, Ltd. In *re* Underground Electric Railways Co. of London (on application of Liquidator). In *re* Essex Radio Supplies, Ltd. (on application of Official Receiver and Liquidator, with witnesses).

Actions before Mr. Justice Luxmoore or Mr. Justice Bennett.—Electric Factors, Ltd., *v.* Duncan Watson (Electrical Engineers), Ltd. British Thomson-Houston Co., Ltd., *v.* Dundas Fox, Ltd.

In the King's Bench Division.—(With a special jury), British Railway Traffic & Electric Co., Ltd., *v.* May (action for detinue). (Non-jury), Adcraft, Ltd., *v.* Adey Portable Radio (action for work). Evans *v.* Electrolux, Ltd. (commission). Bishop *v.* Marconi International (contract).

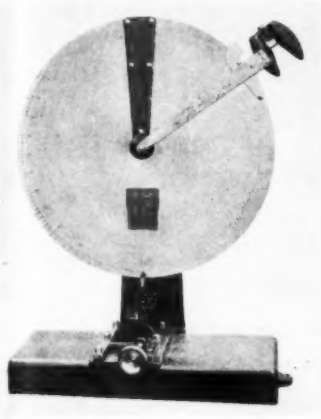
Under new Procedure Rules (before Mr. Justice Horridge).—Franco-British Electrical Co., Ltd., *v.* Yelin (goods sold; trial of counterclaim only).

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Impact Tester

This machine was designed by Olsen to meet the tentative specifications of the A.S.T.M. Committee on electrical insulating material. It is suitable for testing many other materials where a relatively light blow is desired, and the machine illustrated is intended for use on abrasive materials. The apparatus is essentially for production, and it is, therefore, of simple and robust design with a minimum of working parts.

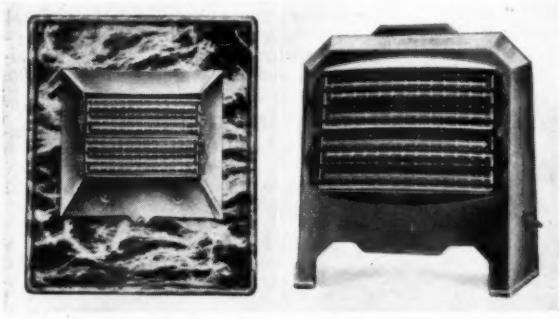


The Olsen tester

The linear velocity of the striking head is approximately 11 ft. per sec., and the drop is constant from a fixed height. Specimens up to 9 in. long are held in the anvil, the supports of which are adjustable up to 6 in. square. The energy absorbed in fracturing the specimen is read direct on the graduated dial. The machine illustrated is designed for the Charpy test, although it can be adapted for the Izod test or supplied with interchangeable equipment to make both tests; its capacity is 100 kg. cm. and the makers are EDWARD G. HERBERT, LTD., Atlas Works, Chapel Street, Levenshulme, Manchester.

English Electric Fires

Included in a large range of new fires made by the ENGLISH ELECTRIC CO., LTD., Stafford, are four of the reflector type and three new portable cast-iron models. The reflector fires have a rod type 1-kW element and can be obtained with a tubular



The English Electric chromium-plated sheet steel fire fitted in a cast-iron panel and a portable model

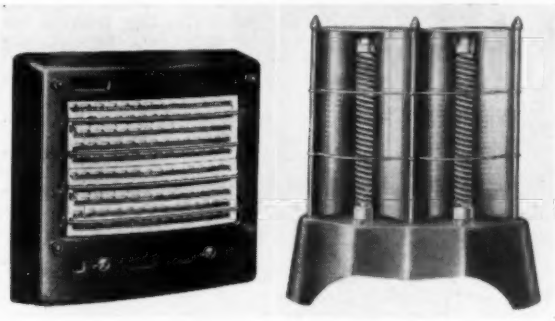
frame, a pedestal base, or for wall mounting. The prices range from 27s. 6d. to 39s.

The portable fire is made in 1-, 2- and 3-kW sizes (costing 18s., 27s., and 38s. 6d. respectively) in sunrise, rainbow, light green or steel blue vitreous enamel. The inset fire, which costs 34s. 6d. as a cast-iron vitreous enamelled model, or 46s. 6d. when made of sheet steel and chromium plated, has two separately controlled 1 kW elements. Various types of surround are available, including a slate panel finished in light marble and another finished in black with a marble vein. The slate panels, which measure 24 in. by 36 in., cost £2, but a smaller size (24 in. by 30 in.) is also available, as well as a handsome cast-iron panel finished in black and white synthetic enamel.

Reflector and Inset Fires

Of the two Jackson fires which we illustrate, the reflector type is made in 1-, 2- and 3-kW sizes. It is of the vertical bar type and consists of a cast-iron base with alloy reflector and fitted with a new type of element. The base is finished in silver with black relief, green with cream relief, tile red with ivory relief, and dark blue with grey relief, and all sizes are readily portable. The prices are 14s., £1 8s., and £2 3s. for the one-, two, and three-bar fires respectively.

The inset type fire was introduced at the beginning of the year, but improvements in design have lately been effected consisting of the introduction of double-pole switches on all sizes. The three-bar fire has two double-pole switches—two bars controlled on one switch and one bar on the other switch. A range of five vitreous enamel colour finishes and a chromium plated model are obtainable. The prices of the vitreous enamelled fires are £1 2s., £1 16s. 3d., and £2 10s. 3d., while chromium-plated models are sold at £1 10s. 6d., £2 9s. 9d., and

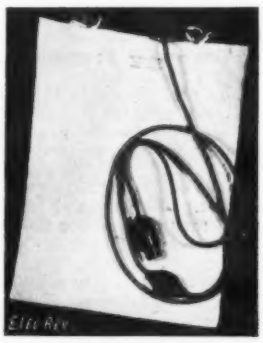


The new Jackson inset and reflector fires

£2 19s. 9d., 1-, 2-, and 3-kW sizes. The manufacturers are the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, London, S.W.1.

A Single-heat Warming Pad

During the coming season the AUTO-MAID VACUUM CLEANER Co., 62, Blandford Street, London, W.1, is to market a single-heat warming pad which measures 15 in. by 12 in. and has a loading of 60 W, giving a temperature of 160 deg. The price, complete with a washable cover and lampholder adaptor, is 15s.



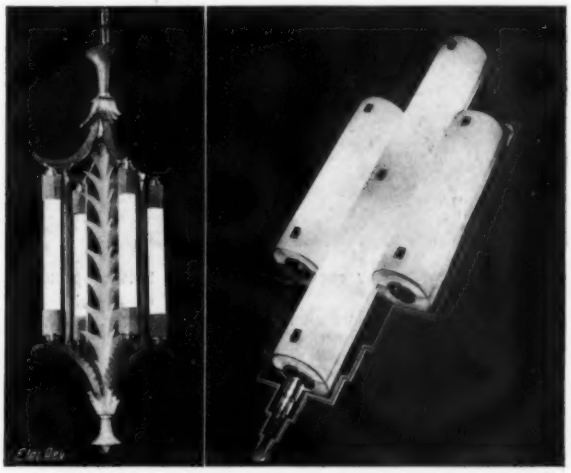
The Auto-Maid warming pad

A Smaller "Osira" Lamp

The well-known 400-W "Osira" lamp was first marketed by the G.E.C. for the lighting of streets and large industrial spaces at the beginning of 1933. Where main roads are so lighted the adjoining secondary roads often appear dark and patchy by contrast, but the introduction of a 250-W size will now enable these secondary roads to be provided with the same uniformity of road brightness but at a lower level. They have all the advantages of extra visibility associated with the electric-discharge light.

Apart from public lighting the new lamp will enable this type of illumination to be extended to industrial uses for which the light output of the 400-W lamp has been excessive.

The new lamp's light output is 2½ times that which would be given by a tungsten filament lamp of the same wattage. It will start at any voltage between 200 and 250 V, having an efficiency of 35 lumens per watt and an output of 8,750 lumens, with an average life of 1,500 hours. Its price is 37s. 6d., plus 50s. for a choke and 25s. for a condenser. The running current, including choke and condenser, is 1.3 A, and the starting current 3 A, the power factor being 0.88. Special lanterns are available from the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.

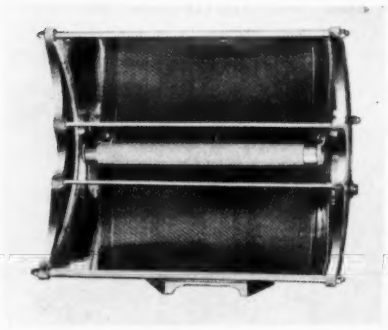


Two attractive lighting fittings made by Messrs. Troughton & Young, Ltd., 143, Knightsbridge, London, S.W.

D

A Swivelling Reflector Fire

The ARORA CO., Loughborough, is adding a new model to its range of fires this season. It is known as the "Projector," and is fixed on a swivel allowing the heat to be directed where required. The reflector is chromium-plated, and although a pedestal is provided the fire can be fixed to the wall for use in the bathroom. Two models are available, loaded at 1 and 1½ kW and priced 26s. and 37s. 6d.



The Arora "Projector" fire

The Philips Battery Charger

A battery charger is shortly to be placed on the market by PHILIPS INDUSTRIAL, 145, Charing Cross Road, London, the first models of which will be seen in the garage equipment section of the Motor Show at Olympia. Each charging circuit has its own rectifying tube, so that both the current and voltage of each circuit can be varied independently of the others; further, in the event of mains failure the three portions are completely isolated from each other, and the cells cannot discharge either through one another or through the rectifier.

There is considerable circuit flexibility, each circuit being provided with a voltage switch and slide resistance. Circuit No. 1 has voltage tappings enabling 20 or 40 cells to be charged at 1 A or 60 cells at ½ A; No. 2 is tapped to charge 10, 20, 30 or 40 cells at 3 A; and No. 3 is tapped to charge 6 or 12 cells at 6 A.

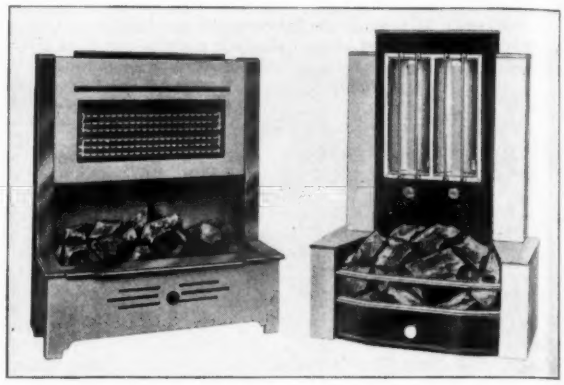
The first circuit is thus suitable for charging 120 V accumulators without splitting them into their component blocks. As many as four or five of these can be charged in parallel; this circuit can be used for small mass plate accumulators. The second will charge up to three 40-cell banks at 1 A, or one bank at any rate up to 3 A, and so is suitable for charging the accumulators of portable wireless sets. The third may be used for the charging of larger cells or car batteries. On full load the charger takes 940 W, while the no-load consumption is 75 W. It is housed in a black-enamelled steel case, and is provided with an earthing terminal. Model 1365, as the charger is called, is suitable for a.c. mains of standard voltages, and is priced at £27 10s.

The "Mistless" Shaving Mirror

MELVIN, LTD., 17, Leighton Place, Kentish Town, London, N.W.5, inform us that the "Mistless" shaving mirror, which has already been described in these columns, will be available in a new form, *i.e.*, the casing and reflector, instead of being finished in white cellulose, will be aluminium treated by a new process giving an untarnishable finish with a high reflective efficiency. The price will be the same as that of the chromium model (21s.).

Belling Fire Developments

The 1935 catalogue which we have received from MESSRS. BELLING & CO., Enfield, includes three new models which have recently been added to the company's range of electric fires. Two of these have imitation coal in the grate and different elements. These two models, known as the "Dorchester" and the "Carlton," are both loaded at 2 kW. The former, in a finish of satin silver and chromium plate, costs £4 10s., and is equipped with standard Belling multi-parabola firebars with horizontal elements. The other model, costing an additional £1 15s., is in a similar finish and has its elements in front of chromium-plated reflectors, the pillars at the side being in satin silver.

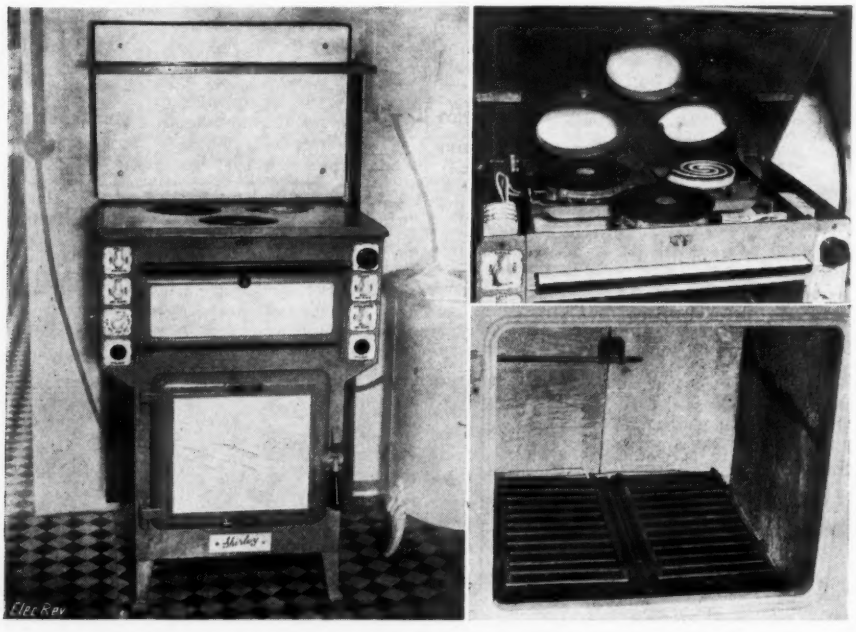


The Belling "Dorchester" and "Carlton" fires

There has been a tendency this year to fit the portable reflector fires into tubular frames which are attractive and yet enable the weight to be kept down to a low level: the Belling fire of this type is the "Chrome-Ray," which is made in ¾, 1 and 2 kW sizes at £2 2s. 6d., £2 5s. and £3 5s. respectively. In common with general practice the tubular frame is chromium plated.

The "Shirley" Cooker

Perhaps the most interesting feature of the Croydon electricity undertaking's exhibits, referred to on page 451, is the new "Shirley" cooker which, we were told, has been designed by Mr. C. J. Whitehead, hire superintendent, under the direction of Mr. F. M. Rendell-Baker, the borough electrical engineer, and is to be built by the Department for hiring-out purposes. It has two "Chromalox" (1,150-W) and a Revo "Superspeed" (2-kW) boiling plates, in addition to a separate 1,500-W grill, within a hob space of 27 in. by 18 in.



The Shirley cooker, showing the boiling plates and the oven interior

The cooker's height to the hob is 37½ in. Automatic oven temperature control between 200 deg. F. and 600 deg. F., continuously, is another important feature. The specially made thermostat projecting into the oven from the side near the back is controlled by the pointer switch knob at the front *via* a small right-angle worm gear and connecting-rods. When the preset temperature is reached it is indicated by a green pilot light on one of the winged switch plates.

Top and bottom heating is employed, the threaded mica-strip constructed elements being somewhat heavier than is (or was) usual, no doubt because of a higher loading being permitted by the absence of series-parallel control. An oven cooking space of 15¼ in. by 14 in. by 15 in. is permitted by a new form of cellular stone insulation, not only because of a reduction in the thickness of the actual insulation, but also because of the absence of any interior support for it.

There are two short switch panels, one on either side of the cooker, and it seems that the undertaking considers that the additional width involved is more than compensated for by it not being necessary to stoop to reach the lower switches. One panel carries a kettle plug and an ordinary main pilot lamp.

The general design is simple, with particularly easy-to-clean interiors, while a plate rack surmounting a high splash plate, similar to the conventional gas cooker design, is a little unusual.

The Electrical Film Campaign

E.D.A. to provide "talkies" for electricity authorities

A DEFINITE move forward in electricity supply propaganda work has been made by the British Electrical Development Association this week. On Wednesday, October 3rd, there was despatched to its members a finely produced brochure containing full information regarding a National Film Campaign in which it hopes for the hearty co-operation of electricity supply authorities during the coming months. The letterpress pages of the publication are interleaved by whole-page illustrations printed on celluloid. The literature includes a letter from Sir William Ray, the Executive Chairman, synopses of the films to which we refer below, and contract letters for the attention of members wishing to avail themselves of the service that is now placed at their disposal. There is also a book of forty pages entitled "Past, Present and Future," in which the tales for the three films are told in full.

The plan embodies a 75-minute programme of talking films. Three of them have been specially produced for E.D.A. by London Film Productions, Ltd. (who made "The Private Life of Henry VIII"), in collaboration with the Western Electric Co., Ltd. The theme throughout is the conflict between old and new, portraying in a simple, pleasant but convincing fashion the idea of electricity, its necessity and simpleness, and its apparatus. The last film concludes with a request to the audience to fill in their names and addresses on cards for a booklet bearing the title of one of the films, "Plenty of Time for Play." This creates a direct means of follow-up, and the exhibition may be made the spear-head for a great selling campaign. There is also a short musical or comedy entertainment film. Only safety film is used, the equipment is British, and the operators are trained men.

The scheme has cost the Association £12,000 to £13,000 to prepare. There is no question of the Association's conviction of the practicability of the project, and it is bearing the entire cost of production itself. For the films to be shown in their area, members only have to pay for the work of distribution.

Two methods of displaying the pictures have been arranged. Through one of these the story will be told to audiences which already meet more or less regularly in most places, such as social, political, professional and other associations, educational groups, workers' unions, religious organisations, friendly societies, adult educational groups, business men's organisations, boys' and girls' clubs, schools, &c. Such meetings and meeting places abound in every electricity supply area, large and small. In this case all arrangements are made by the Association, even to the issue of posters and handbills, and the inclusive charge for a single showing is £4, though it is unlikely that any authority anywhere will be satisfied with only one attempt. The member responsible will be invoiced each month for the shows that have taken place in the preceding month, and these invoices will be accompanied by certificates indicating the number and size of the audiences and a report on the carrying out of the exhibition by the local society.

Another way is through invited audiences, in which case it is necessary for a theatre to be improvised in an ordinary demonstration room or by screening off part of the electricity supply showroom to provide a space of, say, 40 ft. by 20 ft., or more. The local publicity will be left to the member, but the Association offers to advise on this matter. Copies of "Plenty of Time for Play" may be overprinted, and there are gramophone records of the theme song which may be used as complimentary reminders of the performance and distributed to those who apply for booklets. For a week's showing the charge is £25, the number of daily performances being left to the discretion of the member. Bookings must be made at least six weeks before the first of the month in which the exhibition takes place.

Showings will start in November, and E.D.A. hopes that within the first year the films will be exhibited to at least five million picked people, a task which will involve over twenty thousand performances with all the attendant details. The Western Electric Co. is distributing the films by means of its road show service, which is capable of giving two or three thousand showings a month.

The Three Films

"The Wizard in the Wall," the first of the three special films, provides a fascinating glimpse of the development of electrical science. The opening scenes show a modern couple arguing with a die-hard mother-in-law (who holds the purse strings) over the vexed question of installing an electric cooker. They are interrupted by the entry of two children of the household who demand a bed-time story. The father decides to tell them of the history of magnetism and electricity, and the scenes rapidly change showing Thales producing electricity by rubbing amber, Franklin flying a kite in a thunderstorm, Davy, Faraday, Swan and Edison, down to the present day grid network crossing rivers and mountains and burrowing into the earth. The little girl shivers and her grandmother bends to turn on the electric fire, then laughs and says "Maybe you're right."

The second film, "Well, I Never!" deals with the present. In a kitchen everything seems to go wrong with a young woman who has a black smear across her face as a result of poking the fire. She sets a flat iron on the cooker and strikes a match. Bang! down comes a sticky flypaper into the tapioca. While out for a walk she is persuaded to enter an electricity showroom where the whole idea of electric cooking is explained to her. Soon there is a transformation in her home, which becomes cleaner and tidier, the husband being delighted by appetising meals, and "everything ends happily."

Finally, in "Plenty of Time for Play," a peep is taken into the future. The scene is 1955 and shows "Geoffrey" in an office dictating a letter into a combined typewriter and dictaphone machine. At 3.30 p.m., he exclaims: "Well, that's another day's work done." His room-mate grumbles that in the "good old days" he would have been dismissed for finishing at this time, but Geoffrey stops him with an invitation to dinner. At home, Mrs. Geoffrey, who has been televised, is seen pressing various buttons for the meal. Other marvels are shown before the scene reverts to "dull old 1935" in an ingenious manner, introducing the booklet by the name of the film and leading up to the filling in of the cards of application, which will be distributed to the audience.

Other Activities

Amongst the smaller campaign efforts which E.D.A. has in hand this autumn is the direct mail campaign of the Electric Vehicle Committee in which prospective users of modern light electric delivery vans will be approached, dairymen and bakers being concentrated upon more particularly. A booklet on "How to reduce your Delivery Costs" is now ready.

The Industrial Heating Committee is preparing a new series of booklets dealing with the applications of electric heat in particular trades.

The Association will be actively assisting at various electrical exhibitions, an important one in which many leading domestic electric apparatus makers will take part, being that fixed for the Queen's Hall, Cannock, from October 29th to November 3rd. Floodlighting of buildings at Cannock, lectures and demonstrations and other special features are included. For the Portsmouth Corporation Electricity Department, E.D.A. is designing and arranging a special stand at the General Trades Exhibition which will be held there from November 14th to 24th. Then again, the Association will take part in the Contemporary Industrial Design Exhibition at Dorland Hall, Regent Street, from October 22nd to November 10th.

The Association's calendar for 1935 has monthly sheets, on each of which is an illustration from an original drawing depicting light through the ages, and a sales message. A 16-sheet water-heating poster in six colours is available.

ELECTRIC LIGHT
THE MODERN LIGHT FOR MODERN HOMES
ELECTRICITY CHEEP IN DARKER DAYS
LIGHT WHEN AND WHERE YOU NEED IT
A TOUCH OF THE SWITCH FILLS THE HOME WITH SUNLIGHT

The E.D.A. window display for October

New Books

Electrical Measurements in Theory and Application. By A. W. SMITH. Pp. 413; figs. 243. London: McGraw Hill Publishing Co. Price 18s.

The author has rewritten much of the text of this book, now in its third edition, and has recast the chapters on electrical and magnetic units in order to incorporate and explain the 1930 definitions of the gauss and the oersted. Commercial methods are touched upon only very lightly, but considered as an elementary laboratory handbook, the work is a very good one. It may also be regarded as a rudimentary treatise on electrical theory illustrated with reference to measurements.

The theory of electrical and magnetic units is dealt with thoroughly, but it is somewhat surprising to find this matter placed at the end, rather than at the beginning of the book. The early chapters deal with d.c. ammeter and voltmeter tests, ballistic and current galvanometers, the Wheatstone bridge and the d.c. potentiometer. These chapters are clearly written but are conventional and are illustrated by further chapters dealing with the actual measurement of current and power in d.c. circuits. After a chapter on electron tubes, there follows a lengthy treatment of electromagnetic theory and magnetic testing. A.c. bridge tests are considered in detail, and a praiseworthy feature of the explanations is the collection of vector diagrams showing the conditions with the bridge out of balance and in balance. It is remarkable that the vibration galvanometer is not referred to in connection with the a.c. bridge tests. While considerable space is devoted to elementary a.c. theory, the treatment of a.c. instruments is scanty, no reference being made to power measurements in polyphase circuits. In the section dealing with the testing of wattmeters for a.c. circuits, the question of accuracy in inductive circuits is completely passed over. A short description of the a.c. potentiometer might also have been expected. While the treatment of the subject is generally lucid and the text is illustrated by excellent diagrams, the serviceability of the work to students would have been still further increased by the inclusion of some worked numerical examples.

Whittaker's Arithmetic of Electrical Engineering. Fourth edition, revised by A. T. STARR, M.A., B.Sc., London. Sir Isaac Pitman & Sons, Ltd., Parker Street, W.C.2. Pp. 195. Price 3s. 6d.

The late Professor Perry, one of the greatest teachers of engineering science, has written that the practical engineer is a man who "must be able to make calculations," and this excellent little book should go a long way towards enabling him to do so. It is not, however, merely a collection of elementary electrical formulæ to which are attached a number of numerical exercises, but a brief survey of the theory upon which the formulæ are based. The student—or the practical engineer during his leisure hours—working systematically through this book would be able to revise the fundamental principles in addition to following, step by step, the working out of typical examples in which the formulæ are employed, before he attempts the graduated collection of exercises with answers appended to each chapter. The subjects covered range over the entire field of d.c. engineering (excluding machine design), giving the usual formulæ for circuits in series and parallel, testing of generators and motors, work and power, illumination and a valuable chapter on electric supply economics. We would suggest that in the next edition a few elementary calculations on a.c. circuits should be introduced.

A more serious criticism is that the exercises have not always been brought up to date. Where an example is taken from a 1908 paper of one of the recognised examining bodies it would not, perhaps, be legitimate to alter the figures, but why in the other exercises could not present-day values be employed? Thus we find frequent references to "glow" lamps and "Tantalum" lamps, while we search in vain for the accepted term "metal-filament" lamp. Moreover, the consumption of the lamps is given at 3 to 4 W per c.p.! Surely it would not have been a difficult matter to revise these and other out-of-date figures?

The Power Factor Booklet. By R. Emberton. Pp. 83; illus. London: The Electrical Apparatus Co., Ltd., 2s. 6d.

This little book is a revised and enlarged edition of a publication issued in 1924. In its original version the contents consisted mainly of a collection of analogies of power factor (including articles reprinted from the ELECTRICAL REVIEW) to assist those negotiating with industrial consumers or trying to be helpful to members of electricity committees.

In the present volume the scope has been extended by explanations of electrical terms and of the basis of tariffs given in a manner that will enable the layman to obtain an insight into the main factors that govern electricity supply and charges. Two of the four sections into which the work is divided are of more technical interest, but the whole is to be recommended to consumers' engineers who are likely to have the unenviable task of explaining power factor either to industrialists or to electricians with only d.c. experience.

* * *

Shorter Notices

"Tait's Electrical Directory of Australia and New Zealand." (Ninth edition.) Pp. 274. Melbourne and Sydney: Tait Publishing Co. Price 8s., post free.—The present edition of this familiar handbook, which was first published in 1912, has been wholly revised and the information brought up to date. It contains a complete list of the electricity supply undertakings and tramway systems of Australia and New Zealand, and in the majority of cases particulars are given of plant, system and voltages, statistics of output, rates charged, and the names of officials.

"Automatic Protective Gear for A.C. Supply Systems," by J. Henderson. Pp. 201; figs. 117. London: Sir Isaac Pitman & Sons. Price 7s. 6d.

"Die Elektrischen Maschinen," by M. Liwschitz. Pp. 409; figs. 307. Germany: B. G. Teubner. Price R.M. 22.50.

"Electrical Measurements in Theory and Application," by A. W. Smith. Pp. 413; figs. 243. London: McGraw Hill Publishing Co. Price 18s.

"Electrical Engineering Design—Class Manual," by S. Parker-Smith and M. G. Say. Pp. 221; figs. London: Oxford University Press. Price 5s.

"Mysteries of the Atom," by H. A. Wilson. Pp. 145; figs. 40. London: Chapman & Hall. Price 10s. 6d.

Swedish Electrical Trade

THE following statement gives the values last year, compared with 1932, of the principal items in Sweden's electrical trade. It will be seen on the import side that although Germany still predominates as a supplier, her share in a number of groups shows a decline and that of Great Britain, while still small, shows an advance. Considerable space would be needed to give details, since, for example, as many as forty-three different countries figure as outlets for Swedish dynamo-electric machines.

It may be noted that Sweden's leading markets for her vacuum cleaners are Canada, Switzerland, Holland, Denmark, Australia, Belgium and New Zealand.

IMPORTS

	1933. Kron. (000).	Inc. or Dec. Kron. (000).
Batteries, accumulators and parts—		
Total	2,288	− 1,449
From United Kingdom	408	+ 23
„ Germany	923	− 1,033
Radio apparatus—		
Total	7,871	+ 305
From United Kingdom	801	+ 342
„ Germany	3,291	− 610
„ Holland	2,691	+ 421
„ United States	338	+ 169
Motors, generators, transformers and convertors—		
Total	2,778	− 150
From United Kingdom	113	+ 21
„ Germany	2,125	− 162
Stators, rotors, current collectors, etc.—		
Total	476	+ 64
From Germany	362	+ 45
„ United Kingdom	14	—
Metal filament lamps—		
Total	1,019	− 111
From Germany	387	− 29
„ Holland	314	− 139
Carbon for electrical purposes—		
Total	1,744	− 76
From United Kingdom	202	+ 65
„ Germany	529	+ 14
Regulating and control apparatus—		
Total	243	− 95
From Germany	197	+ 11
Switches, etc.—		
Total	2,256	− 11
From Germany	2,004	+ 47
„ United Kingdom	46	+ 35
Electricity meters—		
Total	844	− 308
From Germany	801	− 261
Other electrical measuring instruments—		
Total	656	+ 7
From Germany	534	+ 37
Insulated cables and wires—		
Total	1,796	− 154
From Germany	1,440	− 267
X-Ray apparatus—		
Total	171	− 126
From Germany	148	− 116
Insulating tubes—		
Total	100	− 39
From Germany	188	− 40
Vacuum cleaners—		
Total	296	+ 22
From Germany	278	+ 29

EXPORTS

	1933. Kron. (000).	Inc. or Dec. Kron. (000).
Motors, generators, transformers and convertors—		
Total	9,526	− 858
To United Kingdom	351	− 120
„ Soviet Russia	958	− 486
„ China	266	—
„ Persia	63	+ 21
Vacuum cleaners—		
Total	4,028	+ 733
Accumulators and parts—		
Total	1,621	− 48
Stators, rotors, current collectors, etc.—		
Total	2,920	+ 809
To United Kingdom	756	+ 301
„ France	1,170	+ 605
Switches, etc.—		
Total	543	+ 26
To United Kingdom	23	− 12
„ Soviet Russia	52	− 75
Telegraph and telephone apparatus—		
Total	4,623	− 2,513
To Italy	390	− 747
„ British South Africa	320	+ 13
„ Poland	1,830	− 1,216
„ India	270	+ 219
Insulated wires and cables—		
Total	1,938	+ 30
To United Kingdom	42	+ 29
„ Mexico	180	− 45
„ Persia	19	+ 19
„ China	24	− 1
Metal-filament lamps—		
Total	802	+ 84
To Denmark	277	+ 83
„ Norway	273	− 31
Carbon for electrical purposes—		
Total	195	− 35
To United Kingdom	13	− 18
„ Norway	53	− 43
Radio apparatus—		
Total	889	− 102
To Finland	230	+ 14
„ Brazil	83	+ 53
„ Argentine	76	+ 57

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures

A Crompton Development

Messrs. Crompton Parkinson, Ltd., have announced a further extension of their activities by the formation of a new subsidiary, the Atlas Sprinkler Co., Ltd. Among the companies which they now control are Derby Cables, Ltd., the British Electric Transformer Co., Ltd., F. and A. Parkinson, Ltd., Crompton Kye Lamp Sales, Ltd., British Electric Glass Co., Ltd., and the Kye Electrical, Ltd. The directors of the Atlas Company will be: Mr. E. C. Holroyde (chairman), Mr. F. Parkinson and Mr. W. R. Chisholme. Mr. F. Parkinson, chairman of Crompton Parkinson, Ltd., states that the new company will carry on the business of the manufacture and installation of automatic sprinklers and other fire protection apparatus.

The Croydon Electric Home Exhibition

Although domestic electrification in Croydon has developed rapidly during the past few years, the Corporation Electricity Department is fully alive to the possibilities of further expansion. An electrical exhibition held two years ago proved so successful, that a similar exhibition, but on a larger scale, has been arranged at the Public Halls, Croydon. This was formally inaugurated on September 27th by the Mayor (Ald. J. Trumble). In opening the proceedings, Coun. A. L. Boddington, chairman of the Electricity Committee, said that the last exhibition attracted 12,250 persons, 70 per cent. of whom were prospective consumers. He announced that it had been decided to form a local branch of the Electrical Association for women. In declaring the exhibition open, the Mayor reviewed the progress made by the electricity undertaking since its inception in 1896. He gave figures showing the rapid strides made since 1920 when the electrical energy generated was 13 million kWh, against 152 millions during the past year, and the number of consumers was 6,900, as compared with 42,000 to-day. Under the hire-purchase wiring scheme, 11,945 applications had been received, and work to the extent of £29,350 had been executed by registered electrical contractors. In their workshop they had reconditioned 146 electric cookers and assembled 428 new cookers. He referred to an automatically controlled electric cooker designed and assembled by the Electricity Department (see page 448). Coun. Carpenter, in proposing a vote of thanks to the Mayor, paid a tribute to Mr. F. N. Rendell-Baker, the borough electrical engineer.

The exhibition is in two halls, the Corporation occupying a large stand in the centre of one of them, on which are displayed electric cookers, water heaters, bathroom appliances, &c. A large number of electrical manufacturers are participating in the exhibition, the result being a representative and varied display of all electrical apparatus for comfort and utility in the home. The exhibitors include the following:—Messrs. Belling & Co., Ltd.; Berry's Electric, Ltd.; British Thomson-Houston Co., Ltd.; British Vacuum Cleaner & Eng. Co., Ltd.; Bulpitt & Sons, Ltd.; Credenda Conduits, Ltd.; Croydon Electrical Contractors; Electrolux, Ltd.; Frigidaire Automatic Refrigerators; General Electric Co., Ltd.; Hailwood & Ackroyd, Ltd.; L. G. Hawkins & Co., Ltd.; Hotpoint Electric Appliance Co., Ltd.; Hurley Machine Co. (England), Ltd.; Ozonair, Ltd.; Radio Instruments, Ltd.; Revo Electric Co., Ltd.; Siemens Electric Lamps & Supplies, Ltd.; Singer Sewing Machine Co.; Smith's English Clocks, Ltd.; and G. H. Tozer, Ltd.

The catalogue issued at the exhibition is an interesting departure from those usually distributed, the greater part of it consisting of signed articles by ladies on the advantages of electrical appliances in the home. Particulars of the Corporation's hire charges and its electricity tariff are also included. The exhibition closes on October 10th.

Decorative Insulation

The use of M.V. "Traffolyte" for wall panelling is a distinctive feature of the section of the Manchester Corporation showrooms that is devoted to the demonstration of water heating.

This panelling, carried out in white and green, consists of synthetic resin sheets bonded to building board, the butt joints being covered by coloured beading of semi-circular cross section. The material is water-proof and non-inflammable, with a highly polished surface. Its decorative possibilities are considerable as various colours can be obtained, but full scope is not given it in the present case owing to the small size of the panels and the disproportionate width of the beading. Panels of 8 by 4 ft., instead of 20 by 18 in., as used would have produced a better decoration scheme.

The Manchester Corporation showrooms, in which M.V. "Traffolyte" is used for the panelled walls

The panels are produced on a press normally used for pressing field coils by the Metropolitan Vickers Electrical Co., Ltd.

In the U.S.A. the Westinghouse Co. has developed the manufacture of synthetic resin panels on a wide scale and supplied a considerable amount to the turbo-electric liner the *Queen of Bermuda*, built at Barrow.

Inventions Exhibition

The tenth International Exhibition of Inventions was opened on Wednesday last at the Central Hall, Westminster, S.W., and will continue until October 13th.

Trade Commissioner's Visit

The Department of Overseas Trade announces that Mr. J. W. Brigden, H.M. Trade Commissioner at Johannesburg, is at present in this country on an official visit. Mr. Brigden will be available at the Department of Overseas Trade for the period October 8th-13th for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to the Union of South Africa, Southern Rhodesia, Northern Rhodesia and Nyasaland, after which he will visit

Two views of the electrical exhibition which is now in progress at the Public Halls, Croydon.

a number of industrial centres in the provinces. Firms desiring an interview with Mr. Brigden in London or information regarding his arrangements to visit provincial centres should apply to the Department, 35, Old Queen Street, London, S.W.1, quoting reference 2588/34.

Co-operative Advertising in Lancashire

It is the policy of the Lancashire Electric Power Co. and its associated companies to work in close co-operation with the contractors in their area—a policy which is of considerable advantage to both parties. The latest example of this is provided by a recent issue of the *Ormskirk Advertiser*, in which a whole page is devoted to electrical matters. The centre-piece is a pithy article on the activities of the Ormskirk Electric Supply Co., Ltd. Surrounding this are a number of small advertisements by electrical and radio dealers and contractors, while in the lower half of the page details are given of the supply company's assisted wiring scheme.

The all-electric laundry at the Domestic Science School

Recent Contracts

The Chinese Government has placed an order with Standard Telephones & Cables, Ltd., for a toll line scheme which, in linking up the nine provinces of Kiangsu, Chekiang, Shantung, Chili, Honan, Hupeh, Kiangsi, Fukien and Anwhei, will form the backbone of a national telephone network. In addition to exchange switchboards, repeaters and loading coils, the use of a considerable quantity of underwater cable will be necessary for crossing the many rivers that will have to be negotiated *en route*. The chief of these crossings will be at Niveishan (17,000 ft.), Yoszemen (7,000 ft.), Tsinkiang (8,000 ft.), and Crhtaokiao (1,250 ft.). The cable and equipment will be manufactured at the company's factories at Woolwich and New Southgate. It is estimated that the period required for manufacture and installation will be from twelve to eighteen months.

O.K. Bazaars (1929), Ltd., of South Africa, have placed a contract with Waygood-Otis, Ltd., of London, for the installation of six of the latest type of escalators in their store at Johannesburg. They will cost over £20,000.

An Irish Radio Exhibition

An Irish Wireless and Gramophone Exhibition was held last week in the Mansion House, Dublin. It was opened by Ald. A. Byrne, Lord Mayor of Dublin, who, in the course of his address, said that since last year 16,929 new radio licences had been taken out in the Free State, and now there were nearly 54,000 listeners.

Continental Radio Valve Agreement

It is announced that the Telefunken Company, the Ver. Gluhlampen (Tungsram) A.G. and the Dutch Philips Company have entered into an agreement for co-operation in European markets in the trade in radio valves.

Nickel-plating Specifications

The first two of a new series of British Standard Specifications for the plating industry are B.S.S. No. 558, 1934, for nickel anodes and B.S.S. No. 564, 1934, for nickel ammonium sulphate and nickel sulphate for electroplating. The Electrodepositors' Technical Society, among other interested organisations, has assisted in their preparation, and by their use the risk of a spoiled plating bath is considerably reduced. Copies of these Specifications may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

Standard Definitions for Softwoods

The British Standards Institution has just published the Terms and Definitions for Softwoods, which glossary forms the first part of a programme of simple grading rules for timbers generally coming into the country, which the Institution has undertaken, arising out of the Ottawa Conference.

The glossary is divided into four sections, viz., General Terms and Definitions, Sizes, Plywood Terms and Definitions, and Joinery (milled) Terms and Definitions and a comprehensive alphabetical index. Copies of this British Standard (B.S.S. No. 565, 1934) may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

Extensions at the Electrical Domestic School

In our last issue we referred to the extensions recently made at the London School of Electrical Domestic Science. We now reproduce a photograph showing students at work in the all-electric laundry. The equipment includes electric wash-boilers, washing machines, irons and ironers.

A Large Telephone Contract

The successful tenderers for the submarine telephone cable across the Bass Strait, connecting the Australian mainland with Tasmania, are Messrs. Siemens Bros. & Co., Ltd., and Standard Telephones & Cables, Ltd. The cost is about £180,000, and it is expected that the cable will be completed in about twelve months.

According to Mr. H. P. Brown, director of the Australian postal services, the cable will be laid in two sections, each of about eighty-seven nautical miles. The first section will be between Apollo Bay (Victoria) and King Island, and the second between King Island and Stanley (Tasmania), and there will be repeater stations at each of the terminals and at King Island. Provision has also been made for equipment which will enable an Australian ship to repair a fault in the cable, or if necessary, to insert a new length. The cable will weigh about 1,200 tons and will consist of single copper core weighing 500 lb. per nautical mile, and this core will be insulated and protected by layers of special rubber, copper tape, steel rods packed tightly together, and sheathings of jute. In shallow water where the cable ends touch the terminal points and the intermediate station it will be 2¼ in. in diameter, extra sheathing being fitted to protect it from tidal action, and in the sea sections it will be one inch in diameter, the deepest part of the line being 324 ft. Mr. Parkhill, the Postmaster-General, points out that the laying of this cable will complete the telephone network of the Commonwealth, bringing the 14,500 telephones in Tasmania into direct touch with the 490,000 in other parts of Australia and with the radio-telephone service of the world. At the outset three telephone channels will be available and there will be five telegraph channels to provide a service in the event of failure on the existing telegraph cables. The new cable will also be used for relaying wireless broadcast programmes from the mainland stations to Tasmania.

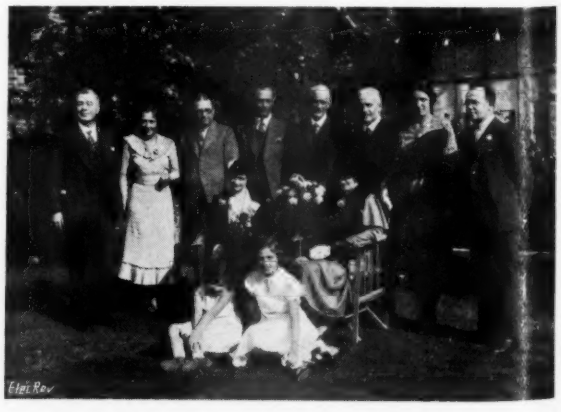
Trade Announcements

Messrs. V. Brook & Co., electrical and radio engineers, Winfield Road, Rugby, have opened additional premises in Sheep Street, at that town.

Mr. L. C. M. Dent, electrical and wireless engineer, has opened premises in High Street, Great Missenden, Bucks.

The Crawley Electrical Exhibition

An electrical exhibition was held at Crawley from September 25th to 29th at which the following firms were represented: The General Electric Co., Ltd.; Drake & Gorham Wholesale, Ltd.; Ferranti, Ltd.; Santon, Ltd.; Electrolux, Ltd.; Simplex Electric Co., Ltd.; Jackson Electric Stove Co., Ltd.; Hoover, Ltd.; Johnson & Phillips, Ltd.; Air-Way, Ltd.; Frigidaire Automatic Refrigerators; and Burnley Components, Ltd. During the week over 3,000 people passed through the doors and showed great interest in the display of domestic apparatus. A noteworthy exhibit was an electric kitchen and bathroom

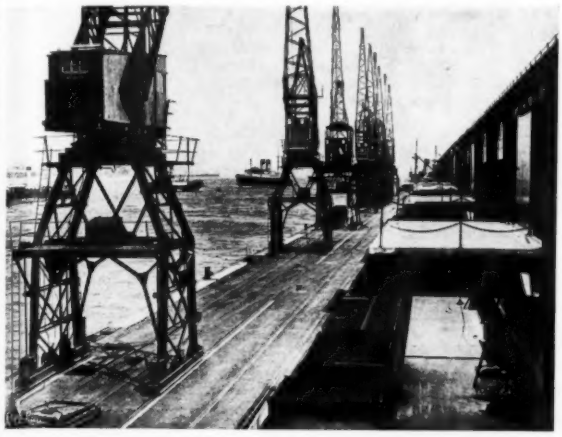


A group at the inauguration of the Crawley electrical exhibition

by a local builder, Mr. Davis, who has decided to erect a large number of houses which will include these features. The accompanying illustration includes Sir Arnold Gridley, K.B.E., chairman, Lady Gridley, who presented an electric clock to the opener, Dr. Matthews, chairman of the Crawley and Ifield Parish Council, Mrs. Matthews, Mr. Avery (manager of the supply in that area) and Mr. Ffrench, of Horsham.

Parkeston Quay Extensions

The extension to the L.N.E.R. Co.'s Parkeston Quay, Harwich, was officially opened on October 1st by Admiral of the



Cranes on the new extension at Parkeston Quay

Fleet Sir Reginald Tyrwhitt. Both the new portion of the quay, the crane track of which bears twelve cranes, three of five tons capacity and nine of 1½ tons, and the older sections are very well supplied with cargo and goods handling equipment. The power for this plant is largely provided by Crompton d.c. motors, 116 of which, totalling approximately 2,000 h.p., have been supplied recently to Messrs. Stothert & Pitt, Ltd., and Ransomes & Rapier, Ltd., for use on cranes now installed at Parkeston. These motors comprise twenty-nine complete crane sets, twenty-one of 1½ tons lifting capacity and eight of 5 tons. The table below gives details of the hoisting, slewing, luffing and travelling motors in each batch.

Number of cranes	12	9	5	3	
Lifting capacity	1½	1½	5	3	tons
Hoisting motors	50	38	50	42	h.p.
Slewing motors	7	7	10	10	h.p.
Luffing motors	3½	3½	5	7½	h.p.
Travelling motors	10	10	15	15	h.p.

The Crompton motors are of the "K.R.N." type specially designed for crane and hoist duties.

Savoy Hotel Alterations

An imposing new entrance hall and foyer to the grillroom have been constructed at the Savoy Hotel, London, as the first of several alterations which are to be carried out. Special attention has been paid to the lighting, for which the sub-contractors were Messrs. F. H. Pride, London. Lampshades are made to tone with the general colouring of the surroundings, which is apricot to pink. The telephone boxes near the bar are handsomely constructed, with sliding sycamore doors. Clocks were supplied by the Magneta Time Co., Ltd. The architects were Messrs. Stanley Hall and Easton & Robertson, FF.R.I.B.A., the general contractors being the Savoy Works and Engineering Departments.

Exide Calendar and Diary

The first calendar for 1935 has come to hand. This is from the Chloride Electrical Storage Co., Ltd., which has retained the services of Edwin Byatt, R.I., the floral artist, for the production of its calendar. Twelve water-colour drawings of carefully chosen subjects are reproduced, each one bearing a subtly restrained reference to "Exide" and "Drydex" selling points.

The "Exide" diary for 1935 is slightly larger than last year's. It has a real leather lizard grained cover and contains a great deal of useful information on the care and maintenance of car and wireless batteries.

The Electrodeposition of Nickel

A new publication (No. L5), written by Mr. A. W. Hothersall, who discusses the more important advances which have been made in the technique of nickel plating during the last few years, has been issued by the Mond Nickel Co., Ltd. The subject is dealt with under the headings of preliminary cleaning procedures; etching treatments for brass, copper and steel; nickel plating of zinc and aluminium; mechanism of nickel deposition; causes and prevention of pitting in nickel deposits; mechanical properties of nickel deposits (tensile strength and hardness, effect of heat-treatment, hardness and polishing); effects of nickel deposits on resistance to fatigue; throwing power of nickel solutions. The information is arranged to give real assistance to the practical plater, and copies of the booklet may be obtained from the company at Thames House, Millbank, S.W.1.

For Sale

The Manchester Corporation Electricity Department has for disposal transformers, isolating switches, knife switches, d.c. circuit breakers, &c. (See our classified advertisements.)

Induction Regulators

Descriptive Section No. 27 of the catalogue of Switchgear and Cowans, Ltd., that has just been issued relates to single- and polyphase induction regulators for hand, motor-operated or automatic voltage control. It contains a large amount of technical information on the design and operation of voltage regulators that should make it of value to all distribution engineers.

An important chapter sets out the case for feeder voltage control not only in view of the permissible limits of variation prescribed by the Electricity Commissioners, but also as a means of increasing revenue. The application of the principle to interconnectors between generating stations, among others, is also demonstrated.

An Advertisement Correction

Owing to a printer's error, a phrase in the advertisement of Unity Heating, Ltd., which dealt with the company's new convector, in our last issue read: "Turn the dial 1-1 and the 'Unity' will do the rest." The figures "1-1" should not have been inserted.

Prices of Materials

Messrs. F. Smith & Co. report, October 3rd: No change in the price of electrolytic copper bars, wire rods and h.c. wire and silicium bronze wire.

Messrs. James & Shakespeare report, October 3rd: No change in the price of copper bars (best selected), sheet and rod. English pig lead, £12 5s., 5s. dec. Electrolytic copper sheets, £30 to £30 5s., 10s. dec.

Messrs. Edward Till & Co. report, October 3rd: No change in the price of Indiarubber, Para fine.

A Large Storage Battery

The illustration on page 454 shows a battery supplied to the G.P.O. by the D. P. Battery Co., Ltd., for the new Central Telephone Exchange, London. This installation, which the company claims is one of the largest in the world, comprises two batteries each of twenty-five cells, having a capacity of 12,900 Ah, whilst the weight of each cell is three tons.

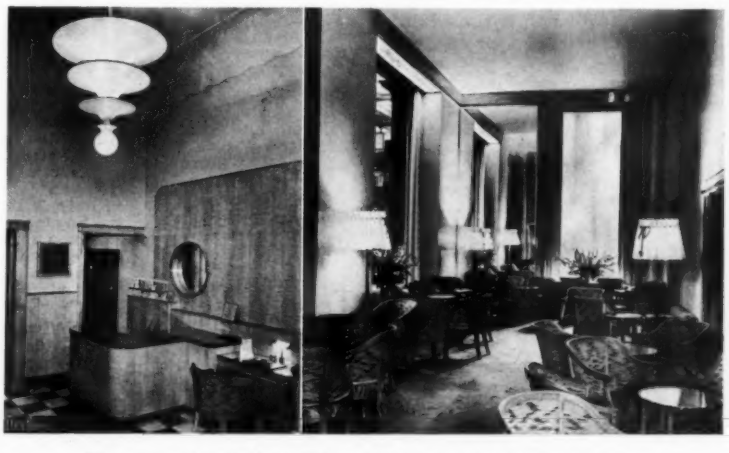
New Catalogues and Lists

S. Bill & Co., Ltd., Queen's Road, Aston, Birmingham.—A leaflet on the new range of "Invicta" switch-fuse.

J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.—A leaflet on new moulded lamp-holders and a complete catalogue of Crabtree products.

Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.—Particulars of kVA indicators.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—A catalogue of "Sieray" discharge lamps and lanterns, and a full catalogue of "Xcel" appliances.



The new entrance hall (left) and foyer to the grillroom at the Savoy Hotel, London

Ferranti, Ltd., Hollinwood.—A booklet on mains radio components.

Cuthbert Andrews, 47, Red Lion Street, London, W.C.1.—Details of the "Goliath" X-ray tube.

The Typerlite Company, 86, Cannon Street, London.—A brochure on wall, desk and bench lighting fittings.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—A catalogue of Henley trailing cables.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—A publication dealing with feeder voltage regulators.

Dussek Bitumen & Taroleum, Ltd., Empress Wharf, Bromley-by-Bow, London, E.3.—A leaflet on "Trinidite" oil-resisting compounds.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, London, W.C.2.—A catalogue of "Supreme" domestic appliances.

Belling & Co., Bridge Works, Southbury Road, Enfield.—A show card for Belling fires.

Albert Phillips, Ltd., Excelsior Works, Eyre Street, Spring Hill, Birmingham, 18.—Catalogue of "Crescent" electric fires and cooking appliances.

Bankruptcy Proceedings

L. E. Pearce, electrical engineer, trading as "St. Johns Electrical Co.," 48, St. John's Road, Tunbridge Wells.—The receiving order herein was made on the debtor's own petition, and he has recently returned a statement of affairs showing gross liabilities of £1,406, of which £1,345 is expected to rank for dividend. There are net assets of £468 and a deficiency of £878. Debtor attributes his failure to heavy overhead expenses and underestimating. It appears that in March, 1932, he and another entered into partnership to trade as electrical and radio engineers at premises in Mount Zion, Tunbridge Wells. At the end of the first year the trading showed a net loss. On February 28th, 1933, the partnership was dissolved, and debtor's partner took over the whole of the assets and liabilities, indemnifying him against any claims by creditors. Debtor received back his £250 by instalments. On April 10th, 1933, he took over an electrical engineer's business at 48, St. John's Road, Tunbridge Wells, and commenced business there on his own account, with a borrowed capital of £195. The work consisted mainly of contracting, and in order to obtain business he gave very low estimates. As a result he incurred losses on nearly all the contracts, but continued trading hoping that he would be able to work up a good connection. He had an overdraft at the bank, which was guaranteed by his father, and which, at the date of the receiving order, stood at £443. The business, however, did not improve, and creditors pressed. At the first meeting of creditors held recently, Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton, was appointed trustee, with a committee of inspection.

F. Adams and **R. Barlow,** trading as Adams & Barlow, electricians, 11, Station Parade, Wanstead.—The first meeting of creditors was held on Monday last at London Bankruptcy Buildings. The receiving order was made on September 17th upon the petition of the General Electric Co., Ltd., and an order of adjudication was made the following day. According to the debtors' statements they began business in December, 1931, with a loan of £250, subsequently increased to £600. In December, 1933, they secured a wiring contract covering work to the extent of £5,000, but only £600 worth was forthcoming. Early in 1934 another showroom was opened in the immediate neighbourhood, and Woolworth's started a stores at Leytonstone which took away business from Wanstead. The debtors return liabilities of £1,400 against assets of £260, and attribute their insolvency to decline in trade, competition, heavy overhead expenses, and under estimating contracts. The Official Receiver will wind up the estate in bankruptcy.

A large storage battery for the Central Telephone Exchange

J. D. Dickinson, 671, Chesterfield Road, Sheffield, wireless and electrical dealer.—Decline in turnover, bad debts, lack of capital, and having to allow substantial discounts to certain customers were stated by this debtor to have caused his failure when he attended at the Official Receiver's offices, Figtree Lane, Sheffield, on September 26th, for his first meeting of creditors. His statement of affairs showed unsecured liabilities of £314, and a deficiency of £64. The matter was left in the hands of the Official Receiver.

D. A. McDonald Trew (Trew Electrical Service), electrical dealer, 36, Binley Avenue, Binley, Coventry.—Receiving order made September 24th on debtor's own petition. First meeting, October 8th, at 9-11, High Street, Coventry. Public examination, November 5th, at the County Hall, Coventry.

E. C. Wood (Radio Equipment Co.), wireless dealer, 15, Brook Street, Chester.—Last day for receiving proofs for dividend, October 13th. Trustee, Mr. I. D. Hooson, St. Peter's Churchyard, The Cross, Chester, Official Receiver.

A. Fielding, electrician, 223, Whalley New Road, Blackburn.—Last day for receiving proofs for dividend, October 17th. Trustee, Mr. J. W. Carter, District Bank Chambers, Blackburn, Official Receiver.

W. S. Fray (R. E. Warren), electrician, 1, Albert Road, Torquay.—Last day for receiving proofs for dividend, October 13th. Trustee, Mr. W. R. Cocks, Exeter Bank Chambers, Broadgate, Exeter, Official Receiver.

A. G. Overton, electrical engineer, 75A, Pasture Street, Great Grimsby.—Last day for receiving proofs for dividend, October 13th. Trustee, Mr. J. F. Wintringham, St. Mary's Chambers, Great Grimsby, Official Receiver.

H. W. W. Alford, wireless engineer, 13, Goldsmith Street, and 261, High Street, Exeter.—Supplemental dividend of 8d. in the £, payable October 5th, at the Official Receiver's Offices, Exeter Bank Chambers, Broadgate, Exeter.

E. S. Mellor, electrical engineer, 15, Cole Street, Scunthorpe.—First and final dividend of 2s. 10d. in the £, payable October 3rd, at the Official Receiver's office, St. Mary's Chambers, Great Grimsby.

W. C. Stephenson, wireless dealer, 1, Barnfield Road, Spennymoor, Durham.—Receiving order made September 20th, on debtor's own petition. First meeting, October 5th, at 32, Frederick Street, Sunderland. Public examination, October 23rd, at the County Court Office, Durham.

F. H. Pountney (Bordesley Electrical Co.), electrical engineer, 164, High Street, Bordesley, Birmingham.—Trustee, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham, appointed September 20th.

W. R. Blakeway (Pearson & Co.), electrical contractor, 31, High Street, Southampton.—Trustee, Mr. H. W. Miles, 44, Above Bar Street, Southampton, released August 16th.

W. H. Tweedle (Premier Radio & Electrical Supplies), radio engineer and dealer, Paddock Head, Paddock, Huddersfield.—First and final dividend of 10½d. in the £, payable September 27th at 71, Manningham Lane, Bradford.

W. H. Secker (Modern Wireless Depôt), wireless engineer, 93, Magdalen Street, Norwich.—First and final dividend of 2s. 7d. in the £, payable September 24th at 4, Eastbourne Place, Prince of Wales Road, Norwich.

C. I. Bentley (Traders Electric Lighting Supply), electrical factor, 9, Fish Street, Hull.—Trustee, Mr. J. E. D. Stickney, 1, Parliament Street, Hull, Official Receiver, released August 27th.

A. Parsons, electrician, 23, Clifton Crescent South, Rotherham.—Application for discharge to be heard on October 11th at the County Court Hall, Sheffield.

Company Liquidations

Electrical Contractors (Sileby), Ltd.—Meetings, October 31st, at Midland Chambers, Warwick Passage, Corporation Street, Birmingham, to receive an account of the winding-up by the liquidator, Mr. F. E. Bendall.

Brown & Oliver (Wireless), Ltd.—Particulars of claims by October 25th to the liquidator, Mr. P. S. Booth, Kimberley House, Holborn Viaduct, E.C.

Electrical & Wireless Equipment Supplies, Ltd.—Meetings October 29th, at 38, Piccadilly, Bradford, to receive an account of the winding-up by the liquidator, Mr. R. Russam.

Guaranteed Accumulator Services, Ltd.—Meeting, October 31st, at Westminster Bank Chambers, Station Road, Harrow, to receive an account of the winding-up by the liquidator, Mr. E. W. Atkinson.

Private Arrangements

Times Electric Co., Ltd., 146a, Queen Victoria Street, E.C.4, factors of electrical accessories.—The adjourned meeting of creditors of the above was held on September 20th, at Anderton's Hotel, Fleet Street. It will be remembered that at the first meeting the creditors resolved to further investigate the position to see the best course to be adopted. The liabilities totalled £3,733, against assets of £1,758. It was decided that the book debts, which were estimated to produce £1,150, should be collected by a representative of the creditors, and that the proceeds from those book debts should be distributed amongst the creditors *pro rata*. That arrangement was made subject to all the creditors agreeing to accept the book debts as a composition, and in the event of any one creditor not accepting the scheme, the necessary steps to be taken for the company to pass resolutions for voluntary liquidation.

E. V. Liley, trading as W. Liley & Co., 62, Hope Street, Liverpool, electrical engineer and contractor.—A meeting of creditors was held recently, when a statement of affairs was submitted which disclosed liabilities of £1,250, of which £1,195 was due to the trade, and there was a deficiency, so far as the preferential creditors were concerned, of £54. The total preferential claims amounted to £268, but the assets were valued at only £213. The bank were fully secured creditors for £902, holding security valued at £1,000. The debtor had been in business for twenty-six years, and was successful at first, but had experienced difficulty recently owing to keen competition in the trade. As the debtor had no offer to submit it was resolved that a deed of assignment should be executed in favour of Mr. K. G. Lyon, as trustee, with a committee of inspection.

A. J. Pickering, trading as P. W. Radio Service, 47, Barking Road, Canning Town, E., wireless and radio dealer.—A meeting of the creditors in this matter was held on September 20th at the offices of Mr. P. S. Booth, Kimberley House, Holborn Viaduct, E.C., when the representative of Messrs. A. Warner & Sons, Ltd., the largest trade creditors, presided. Mr. Weller submitted a statement of affairs which showed liabilities of £747, of which £610 was due to unsecured trade creditors, and the bank were creditors for £137. The net assets were £213, or a deficiency of £529. The matter was discussed, and it was resolved to confirm the deed of assignment. A committee consisting of the representatives of three of the creditors was also appointed.

Dissolutions of Partnership

J. T. L. Mallard & Co., radio engineers, Stockport.—Messrs. J. T. L. Mallard and J. Duke have dissolved partnership. Mr. Mallard will attend to debts.

P. V. Electric, electrical and general engineers, Teignmouth.—Messrs. D. W. Purvey and J. D. Varker have dissolved partnership.

Electricity Supply

Lighting, Domestic, Power

Airdrie.—TRANSFER OF UNDERTAKING.—Following protracted negotiations between Airdrie and Coatbridge Town Councils and the local electricity companies, Airdrie Council has approved a draft agreement taking over from the Coatbridge and Airdrie Electric Supply Co., Ltd., the undertaking so far as Airdrie is concerned. The proposed price is in the region of £112,500, about £80,000 payable by Coatbridge and £32,400 by Airdrie. It is intended that the burghs shall jointly enter into an agreement with the Clyde Valley Electric Co. for the working of the undertaking during the next forty years. A minority of the Council desired to make it a condition of the agreement that the Clyde Valley Co. should undertake the wiring of the municipal houses, and this was remitted to a committee for investigation and report.

Australia.—A SYDNEY MANUFACTURING EXPERIMENT.—In our issue of April 6th we published a brief abstract of a report of Mr. Forbes Mackay, general manager of the Sydney municipal electricity department, which referred to delays in the installation of three transformers built by a local firm. We are asked by the Electrical Plant Manufacturers, Ltd. (Sydney), to state that during the construction of the first of the three 9,000-kVA three-winding transformers, a flash-over occurred on a tapping block due to a defect in the imported synthetic resin employed, and that the construction of the transformer did not cause the slightest trouble. The three transformers have now been in service for several months, and having met all tests satisfactorily they have been taken over by the Sydney municipality. We are informed that all guarantees have been met or improved upon, *e.g.*, the temperature was guaranteed not to exceed a safe limit after fifteen minutes' operation on full load with the oil and cooling-water pumps stopped, and on test the temperature rise was only 13 deg. C. after sixty-five minutes.

Bedford.—SUPPLY TO HOUSES.—The Electricity Committee has agreed to provide a supply (£1,183) to 100 houses being erected at the junction of Mile Road and Elstow Road and to 139 houses at Stewartby Village, Wootton (£1,175).

LOANS.—The Electricity Committee is seeking sanction to borrow £20,000 for meters and £5,000 for house-wiring installations.

MAINS EXTENSIONS.—The Electricity Committee is to extend mains (£836), and sanction has been obtained to borrow £12,338 for the reinforcement of general supply mains, &c.

Berkhamsted.—OVERHEAD LINE EXTENSIONS.—The Rural District Council has consented to the Chesham Electric Light Co. extending its overhead lines at Little Gaddesden to Ringshall.

Birkenhead.—LOANS.—The Electricity Committee has obtained sanction to borrow £8,526 for sub-station equipment, £40,000 for mains and £10,000 for wiring installations.

Belgium.—ANTWERP.—The Compagnie Electrique Anversoise, which has for some years operated the hydro-electric installations of the city of Antwerp, announces that its concession has come to an end. A " mixed " solution has been arrived at under which the concession has been granted to a new company, known as L'Imea, in which the municipal council of Antwerp holds the major part of the financial interest. The Compagnie Electrique Anversoise, which also has a financial interest in the Société de l'Electricité de l'Escaut, will thus in future be a holding instead of an operating concern.

Boston.—EXTENSIONS.—The Rural District Council has consented to overhead-line extensions in various parts of the district by the Boston & District Electric Supply Co.

Bridgend.—POWER STATION TO BE CLOSED.—The Electricity Commissioners have decided that the Council's power station which supplies Porthcawl, Pencoed, Kenfig Hill, Aberkenfig, Bryncethin, St. Brides Major, Southerndown and Ewenny shall be closed and that no further loans will be granted for development. In future the bulk of the electrical supply must be taken from the national grid system. This decision was conveyed to a deputation which applied for a loan for a new boiler.

Bromley.—SUPPLIES TO DOWNHAM HOUSES.—It was announced at a meeting of the Town Council that a canvass of the London County Council's Downham Estate showed that 530 out of 774 tenants definitely wished to have electricity installed. The Council authorised the electrical engineer to make the necessary arrangements for providing the mains, &c., necessary for giving the supplies required.

Cardiff.—ANNUAL REPORT.—The number of consumers at March 31st last was 45,298, an increase of 3,242 during the year. Sales of apparatus, &c., on hire purchase effected through the showroom of the department increased from £1,606 to £4,976. The report also shows that as from January 1st, 1934, temporary arrangements were made with the Central Electricity Board to afford a stand-by supply to the Corporation until such time as the station becomes " selected " under the Electricity Supply Act.

SUB-STATION.—The Electricity Committee is to provide a sub-station in Colum Terrace (£860).

Cannock.—CHEAPER ELECTRICITY.—The Urban District Council has approved reductions in electricity charges.

Coventry.—LOAN.—The Town Council has applied for a loan of £3,182 for mains extensions and sub-station equipment.

Croydon.—SUPPLY EXTENSIONS.—The Electricity Committee recommends extending mains to provide a supply to eighty-eight additional houses at the L.C.C. housing estate at Norbury (£1,000); to 146 houses at Tylecroft Rd., Bulkeley Rd., Northborough Rd. and Norton Gardens (£1,560); and a scheme for installing electricity services at the houses (£3,725).

MAINS EXTENSIONS.—The Electricity Committee recommends the extension of distributing mains, &c. (£2,100).

LOANS.—The Electricity Committee has obtained sanction to borrow £25,055 for boiler house and equipment and £50,000 for mains.

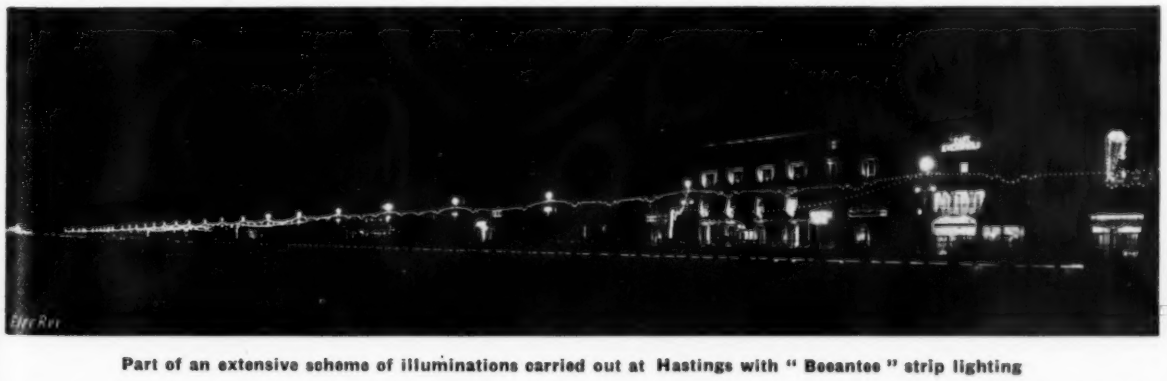
Eastbourne.—SUPPLY EXTENSIONS.—The Electricity Committee is to provide a supply to the major portion of the Beachlands Estate, where it is estimated that 1,400 houses will ultimately be erected (£7,650). Extensions will be made to the remainder of the estate as the building work proceeds. A supply is also to be provided to 350 houses to be erected at Polegate Stud Farm Estate (£6,616).

East Ham.—DISTRIBUTION WORK.—The Electricity Committee is borrowing £16,425 for cables and distribution work.

Enfield.—LOAN SANCTIONS.—The Urban District Council is to borrow £6,670 for the installation of a street fire alarm system.

Exeter.—A SELECTED STATION?—In view of the high efficiency and the low cost of production of the city's generating station the Central Electricity Board is to recommend that it shall be made a " selected " station.

France.—ELECTRICAL PROGRESS.—Our Paris correspondent states that reports on the situation of supply authorities in the upper Loire and Allier river valleys show that this year's drought, which has reduced supplies from hydro-electric sources, has affected the profits of these enterprises, which have had to fall back upon more expensive means of generation. While the number of consumers has increased, the consumption this year is still about 13 per cent. below normal, against 17 per cent. last year. This improvement is due largely to the policy of the companies of extending the use of electrical domestic equipment, and to the development of the purely rural networks. Another unfavourable factor has been the drop in the economic index on which the sale price of electricity is based.



Part of an extensive scheme of illuminations carried out at Hastings with " Beeantee " strip lighting

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee has agreed to the laying of distributing mains (£1,510).

Gloucester.—AERODROME SUPPLY.—The City Council is to carry out mains extensions costing £1,200 to supply electricity to the Joint Municipal Aerodrome at Staverton.

Gnosall.—CHEAPER ELECTRICITY.—The North-West Midlands Joint Electricity Authority is reducing the lighting tariff from 8d. to 6½d. per kWh.

Guildford.—SUPPLY EXTENSION.—The Electricity Committee is providing a supply to a new estate which is being developed at Barnet Hill, near Wonersh (£1,600).

Hailsham.—EXTENSIONS.—The Rural District Council has consented to extensions of overhead cables at Boreham Street by the Weald Electricity Supply Co., Ltd. With reference to supplies at Herstmonceaux and Arlington, the Council has approached the Electricity Commissioners on the subject of Fringe Orders, and a committee is to interview the undertakers concerned.

Halifax.—WATER-HEATERS.—A remarkable increase in the number of water-heaters hired out during the year is shown in the annual report of the borough electrical engineer, Mr. G. A. Vowles. At March 31st, 1932, there were fifty-eight water-heaters connected to the mains, seventeen more were added during 1932-3, but 551 were connected during the year ended March 31st, 1934, an increase of 734 per cent. Wash-boilers showed an increase of 35.4 per cent. (total 1,718) and cookers 28.5 per cent. (4,085). About 14,536 are connected up, there having been a 12.9 per cent. increase during the year under review.

Ingleton.—STREET LIGHTING.—The village streets were recently lighted by electricity for the first time.

Keighley.—LOANS.—The Town Council has received sanction to borrow £6,720 on account of expenditure on switchgear, cables, &c., and is seeking to borrow a further £50,000 for expenditure on mains, service meters and time switches during the next three years.

Liverpool.—CLARENCE DOCK SCHEME.—A recommendation to the City Council proposes application to the Electricity Commissioners for sanction to the borrowing of £344,300 for the extension of the Clarence Dock generating station by the installation of four boilers, buildings and ancillary work.

London.—FINCHLEY.—The Electricity Committee has obtained sanction to borrow £18,000 for mains and consumers' connections. A sub-station is to be erected at Hampstead Garden Suburb, and further mains extensions are proposed (£2,600).

FULHAM.—The Electricity Committee is seeking sanction to borrow £33,865 for the purchase of part of the Gloucester Wharf site in Townmead Road for generating station extensions.

HACKNEY.—The Electricity Committee is to erect a sub-station to deal with the supply to the Northwold Road housing area at a cost of £1,900.

HAMMERSMITH.—The Electricity Committee is to divert cables in Hammersmith Road (£1,290).

LEWISHAM.—The Works Committee has decided to improve the electric lighting in several main and semi-main roads (£900).

PADDINGTON.—The Metropolitan Electric Supply Co., Ltd., is reducing the flat-rate charge for general lighting in the borough from 4d. to 3½d. per kWh.

ST. PANCRAS.—The Electricity Committee is to extend mains at an estimated cost of £2,127, and has obtained sanction to borrow £1,420 for mains and £1,709 for sub-station equipment.

Llandrindod Wells.—REDUCED CHARGE.—The Urban District Council has reduced the charge for lighting from 6½d. to 6d. per kWh.

Longdon (Staffs).—INAUGURATION OF SUPPLY.—The new electricity supply provided by the Trent Valley and High Peak Electricity Co. was inaugurated on Wednesday last week.

Lowestoft.—LOAN.—The Town Council has received sanction to a loan of £1,860 for distribution mains.

Manchester.—LOAN SANCTIONED.—The Electricity Committee has obtained sanction to borrow £112,179 for generating plant for Stuart St. power station.

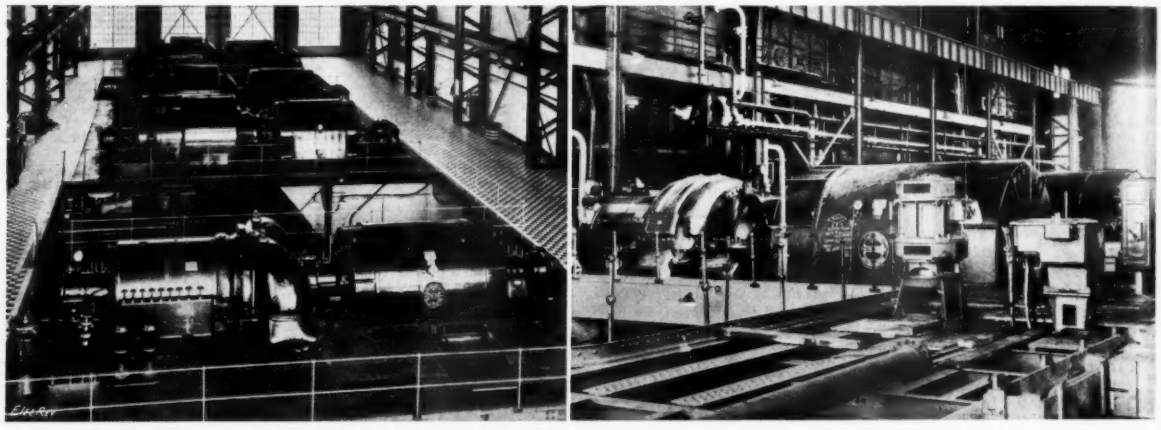
Millport (Bute).—SUPPLY TO TOWN.—The question of an electrical supply for the town is under consideration.

New Zealand.—DEVELOPMENTS.—Among items included in the New Zealand Budget are £550,000 for the completion of hydro-electric schemes which last year returned a profit of £117,000 after meeting all charges, and £260,000 for telephones and telegraph works. The newly completed hydro-electric works at Waitaki, which will ultimately develop 80,000 kW, have been subjected to the engineers' tests and everything was found to be satisfactory. The works will be officially opened by Lord Bledisloe, the Governor-General of New Zealand, on October 27th.—*Reuter* (Wellington).

Nottingham.—EXTENSIONS.—The Electricity Committee recommends application for sanction to a loan of £250,000 for general extensions of mains and services, new sub-stations, transformers, switchgear and mains in connection with the h.v. supply, meters and apparatus for hire, replacement of stokers at North Wilford power station, and work in connection with the assisted-wiring scheme. A loan for a similar amount sanctioned in February last is practically expended.

Sheffield.—CHEAPER CURRENT.—Practically every class of consumer will benefit by the new scale of charges. The concessions benefit consumers to the extent of £75,000 per annum, and date from the first reading of meters after last Sunday.

PLANT EXTENSIONS APPROVED.—The Electricity Committee has obtained sanction to borrow £638,000 in respect of plant extensions at the Blackburn Meadows and Neepsend power stations. The Committee is also to extend mains at a cost of £6,313.



The Congella and Salt River Power Stations, South Africa

South Africa.—CERES.—The Town Council proposes to spend £4,500 on changing over the electricity supply to a.c.

POWER STATION EXTENSIONS.—Illustrated on this page are two South African power stations, the Salt River station and the Congella. This latter is the Electricity Commission's pulverised-fuel station at Durban. The 20,000-kW Parsons turbo-generator can be seen in the foreground. The picture of the Salt River station shows the erection of a second 20,000-kW 33-kV Parsons high-pressure alternator; a third machine of the same rating is now on order.

Southgate.—NEW MAINS.—The North Metropolitan Electric Power Supply Co. is to lay electricity mains in various streets in Southgate.

South Shields.—MAINS EXTENSIONS.—The Electricity Committee has obtained sanction to borrow £10,000 for mains extensions.

Sunderland.—CHEAPER ELECTRICITY.—Subject to the Town Council's approval, the following reductions in electricity charges are to be made: General lighting, 1½d. per kWh (instead of 3d.) for first 5,000 kWh during the summer months and 3½d. (4d.) during the winter; energy in excess of 5,000 kWh will be charged for at 2½d. (3d.) in the summer and 1½d. (2d.) in the winter. The rateable-value charge is to be reduced by 12½ per cent., and the domestic rental by 15 per cent.

Vaynor.—CEFN COED HOUSES.—The Merthyr Traction Co., Ltd., is canvassing houses at Pleasant View and Pontpren, Cefn Coed, with regard to electricity supply.

Warrington.—REDUCTION IN ELECTRICITY CHARGES.—As a result of the satisfactory operation of the Corporation electricity undertaking the Electricity and Tramways Committee is to apply the following reduced electricity charges: Lighting flat rate: first 250 kWh per quarter at 4½d. per kWh; next 250 kWh, 4d.; next 500 kWh, 3½d.; above 1,000 kWh, 3d. Power flat rate: first 500 kWh a quarter, 2½d.; above 500 kWh, 1½d. Power, kVA maximum demand charge: fixed charge for first 250 kVA per quarter, £1 per kVA; next 250 kVA, 17s. 6d.; next 250 kVA, 15s.; next 250 kVA, 12s. 6d.; above 1,000 kVA, 10s.; plus a "unit" charge of 0.33d. (subject to coal clause). All the charges are subject to a discount for prompt payment.

West Lancashire.—TRANSFER OF UNDERTAKING.—The Rural District Council's electricity undertaking, covering an area of 50 sq. miles, was taken over on Monday by the Lancashire Electric Power Co. The company's general tariff is to be introduced, and will mean a substantial saving to most consumers.

Traction

Algeria.—RAILWAY ELECTRIFICATION.—In the *Revue Generale d'Electricité*, M. Victor Nicolet, assistant engineer of the Algerian State railways, gives a lengthy description of the chief features of the electrification of the railway between Bône and Oued Keberit. The three-phase power which is drawn from the steam-operated station at Bône is transmitted at 90,000 V to three sub-stations along the line, being stepped down and converted to 3,000 V d.c. At the sub-station at Bône a.c. power is received at 5,500 V and converted to d.c. by mercury rectifiers.

Belgium.—THE BRUSSELS-ANTWERP LINE.—The first cables have been laid for the electrification of the Brussels-Antwerp line.

LIGHT RAILWAYS.—The Chemins de Fer Vicinaux (the system of light railways) has recently increased its electrified mileage by 53 to 765, or 26 per cent. of the total length. This conversion work has been carried out with a view to reducing operating expenses, as it has been found that on the electrified sections the expenses amount to 94 per cent. of the receipts, whereas on the steam-worked sections the expenditure amounts to 109 per cent. of the revenue. During 1933 the receipts from the electrically operated lines rose by over 1.5 per cent., although those for the whole system decreased by 3 per cent.

Birkenhead.—TRAMS GO.—The Tranmere and Prenton tramcar services terminated last week-end.

Bradford.—TROLLEY-BUSES.—The Tramways Committee has recommended the City Council to adopt a scheme for the replacement of tramcars by electric trolley-buses on the Duckworth Lane route. The estimated cost of £38,500 includes the purchase of 15 trolley-buses made by the English Electric Co. and the Associated Equipment Co., and the extension of the present overhead equipment for a distance of about half a mile beyond the present terminus.

Glasgow.—TROLLEY-BUS EXPERIMENT.—The General Purposes Committee is to consider the question of the experimental running of trolley vehicles.

Holland.—RAILWAY ELECTRIFICATION.—The Dutch State Railway authorities are reported to have decided to proceed with the electrification of the railway between the Hook of Holland and Schiedam, so that electric trains may be able to run between the Hook and Rotterdam, The Hague and Amsterdam.

Japan.—ELECTRIC VEHICLE OPERATION.—During 1933 the 131 electric locomotives of the Japanese Government Railways covered a distance of 6,075,746 km. (3,670,000 miles) with a power consumption of 59,504,716 kWh, or 9.8 kWh per locomotive-km. (15.8 kWh per locomotive-mile). The 1,269 electric motor coaches covered a total distance of 85,965,476 km. (54,350,000 miles) with a power consumption of 152,924,555 kWh, equivalent to 46.7 kWh per 100 car-km. (75.2 kWh per 100 car-miles). The average annual cost of repairs was 4,493 yen per locomotive and 1,339 yen per motor coach, while electric trailer coaches cost 409 yen. There are 16½ yen to the £ at the present rate of exchange.

Liverpool.—NEW TRAMCARS.—The sanction of the City Council is to be sought to a proposal to borrow £150,000 for the provision of 68 bogie truck tramcars.

Nottingham.—MORE TROLLEY-BUSES.—The Corporation is to add thirty trolley-buses to its present fleet.

Portsmouth.—TROLLEY-BUSES.—A meeting of the City Council is to be held shortly to approve the draft Provisional Order authorising it to operate new trolley-bus services in the city.

Sheffield.—TRAMWAY EXTENSION.—The Transport Committee recommends seeking a Provisional Order for the extension of certain tramway routes.

Traffic Signals.—Automatic traffic signals are to be installed at Warrington at Market Gate, the north and south sides of Warrington Bridge, and at the corner of Sankey Street and Crosfield Street.

Billericay Urban District Council has asked the Essex County Council to erect traffic signals at dangerous cross-roads in the district.

The provision of automatic traffic signals at the junction of Windsor Street and Guildford and London streets, and at Bell Corner is being considered by the Chertsey Urban District Council.

The Lambeth Borough Council is to install traffic signals at the junctions of Croxted and Turner Roads, Clapham, South Lambeth and Stockwell Roads, and Camberwell New, Wyndham and Lothian Roads.

It is proposed to erect internally-illuminated traffic-restriction signs costing £121 in Packers Row and Tafton Lane, Chesterfield.

The St. Pancras Highways Committee recommends the installation of vehicle-actuated traffic control signals at the intersection of Judd Street, Compton Street, and Hunter Street (£730).

Warrington.—PROPOSED ABANDONMENT OF TRAMS.—A scheme was considered by the Town Council for the extensive reorganisation of the municipal transport services, involving the abandonment of the tramway system and the rearrangement of the bus routes. The first stage of the scheme, which would be gradual, provides for the change-over of the Sankey and Cemetery routes.

Communications

Australia.—WIRELESS LICENCES.—At the end of July there were 622,674 wireless receiving licences in force in Australia, an increase on the preceding month of 23,515. The numbers for the various States were: New South Wales, 238,625; Victoria, 211,442; South Australia, 66,938; Queensland, 54,906; West Australia, 33,293; and Tasmania, 17,470.

Germany.—TELEVISION.—Plans are under consideration for the construction of a television transmitting station at Brocken, the highest point in the Harz mountains. This station will have a radius of about 100 miles, embracing the towns of Hanover, Brunswick, Magdeburg, Kassel, and Erfurt.

Great Britain.—RADIO RELAY SERVICES.—Blyth Corporation has permitted Broadcast Relay Services to operate a service, and the Northern Wireless Relay Co. has agreed to forgo its rights under an existing agreement with the Corporation. Notts & Derby Relays, Ltd., are now operating at Sutton-in-Ashfield.

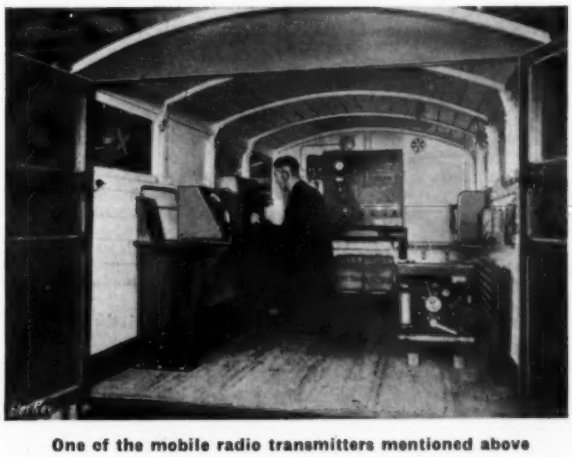
Merlin Relay Service, Ltd., of Llanelly, Carmarthenshire, is to operate in Llandilo. Burnham-on-Sea U.D.C. has permitted Christy Bros., of Chelmsford, to operate a relay system. Broadcast Relay Services, Ltd., which has been operating in Hull for two years, is being taken over by a newly formed company, with capital increased from £30,000 to £75,000, providing for extension beyond the city. The present directors will be on the board of the new company. Belfast Corporation is to invite tenders for the franchise to operate a relay system in the city.

At June 30th this year there were 151,685 subscribers to radio relay systems in Great Britain, representing 2.4 per cent. of the total holders of receiving licences. Altogether, 295 central receiving stations were serving 225 towns, twenty-four of which had over 1,000 subscribers and fourteen exceeded 2,000 subscribers.

India.—CALCUTTA AND BOMBAY LAND LINE.—A combined "carrier" telegraph and telephone system, claimed to be the longest in the East, has been opened between Calcutta and Bombay. Hitherto, there has been one physical trunk telephone circuit between these cities, but this was found to be inadequate to cope with the increasing demand for the service. The Posts and Telegraphs Department has now installed on the same pair of wires three additional "carrier" telephone channels. The distance between Calcutta and Bombay is 1,230 miles, and the circuit works over this long distance with five intermediate repeater stations.—*Reuter* (Calcutta).

London.—NEW AUTOMATIC EXCHANGES.—Two new automatic telephone exchanges for South-East London are expected to be put into operation early next year. One will serve portions of Sydenham, Penge and Anerley, and the other Forest Hill, Brockley and the neighbourhood. Another exchange will be opened later to serve Gipsy Hill and West Dulwich.

Wireless at British Airports.—Hull (Hedon), Portsmouth, and Belfast now all have up-to-date aerodrome wireless stations in regular operation, the equipment consisting of Marconi transmitters suitable for either telephone or telegraph operation, and directional receivers enabling navigational aid to be given to aircraft in flight. The apparatus is designed for mobile use and can be accommodated, together with all necessary running machinery, switchboards, and batteries, in a motor lorry or trailer. The Marconi transmitter adopted by the Air Ministry for these stations has a rated power of 500 W (to the valve anodes on continuous-wave telegraphy) and is known as the Type D.M.1a, arranged for quick wave-changing and remote control. The directional receivers for Hull, Portsmouth, and Belfast can be used both for general reception and for directional finding by the Bellini-Tosi system. The Air Ministry now controls in Great Britain a comprehensive system of ground-and-air, inter-aerodrome, and meteorological communications for civil aircraft, with transmitting and receiving stations at Croydon, Heston, Lympne, Pulham, and Manchester, as well as the three new stations mentioned above.



One of the mobile radio transmitters mentioned above

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—November 29th. Metropolitan Tramways Board. P.i. l.c. cable. (A.Y. 12629.)* Traction sub-station units. (A.Y. 12623.)*

November 13th. Posts and Telegraphs Department. Switchboard cable. (A.Y. 12647/8.)*

December 18th. Automatic telephone switching equipment. (A.Y. 12663.)*

November 20th. Telephone dial parts. (A.Y. 12665.)*

SYDNEY.—December 3rd. New South Wales Public Works Department. Hydro-electric plant in connection with the Burrinjuck water power development scheme. (A.Y. 12617.)*

Axminster.—October 12th. U.D.C. Electric wiring installation at Castle Hill house. Tenders to C. Forward, clerk, Council Offices.

Bridgend.—October 9th. U.D.C. H.p. overhead line, transformer kiosk and change-over switch kiosk. (September 21st.)

October 16th. Electricity Department. One 1,000-kVA outdoor type transformer and 11,000-V and 6,600-V cable. (September 28th.)

Burnley.—October 22nd. Electricity Department. Two 400-kVA 3-phase transformers. (See this issue.)

Cardiff.—October 16th. Rural District Council. Voltage-regulating and phase-balancing equipment in the parish of Pentyrch. (See this issue.)

Chichester.—October 8th. City Council. Cables, switchgear, kiosks, outdoor sub-stations, &c., for the development of the south-western portion of the Council's area. (September 14th.)

Dewsbury.—October 12th. Wiring of 104 house. Particulars from borough electrical engineer, Bradford Road.

Doncaster.—October 13th. Rural District Council. Electric wiring of offices. Specifications from the Consulting Engineer, 21, Temple Dale Street, Liverpool; tenders to R. Bowers, clerk, Nether Hall.

Douglas (I. of M.).—October 17th. Electricity Department. One 3,750-kW turbo-alternator and one 40,000-lb. water-tube boiler. (September 14th.)

Dundee.—October 11th. Electricity Department. E.h.p., l.c. and double steel armoured cable. (September 28th.)

October 11th. Corporation. Various works, including electric lighting installations, at 104 houses. Particulars from Quantity Surveyor, 21, City Square; tenders to Town Clerk.

East Grinstead.—October 20th. U.D.C. 6,600-V outdoor sub-station equipment, twelve months' supply of house meters, p.i., l.c. and armoured cables, glass-built mercury-arc rectifiers complete with transformers and e.h.p. switchgear. (See this issue.)

Eccles.—October 8th. Town Council. Electric lighting installation at Winton branch library. Particulars from borough electrical engineer, 1, King Street (deposit £1 1s.).

Ecuador.—QUITO.—November 13th. Municipality. Electric power plant (3,000 h.p.), street-lighting equipment, &c. (A.Y. 12589.)*

Egypt.—CAIRO.—Ministry of Public Works. November 3rd. Electrical material in connection with the installation of overhead and underground networks at Barrages. (A.Y. 12591.)*

October 29th. Portable pumping set. (G.Y. 14321.)*

November 15th. Mechanical and Electrical Department, Ministry of Public Works. Power house equipment at Gordon's Tree Dockyard. (G.Y. 14291.)*

Ministry of the Interior. November 17th. Material in connection with the overhead and underground networks at Chebin-el-Kanater. (A.Y. 12626.)*

November 6th. Material in connection with the electrification of Kafr El Zayat waterworks. (A.Y. 12657.)*

November 10th. Material for the renewal and extension of the distribution system at Manfalout. (A.Y. 12636.)*

GIZA.—December 8th. Ministry of Public Instruction. Apparatus for the electrical laboratory of the Royal School of Engineering. (A.Y. 12577.)*

KHARTOUM.—November 20th. Sudan Irrigation Department. Power house equipment. (A.Y. 12631.)*

ALEXANDRIA.—October 24th. Municipality. Three motor pumping sets, complete with accessories. (G.Y. 14358.)*

Gellygaer.—October 8th. U.D.C. L.p. and e.h.p. overhead line requirements, domestic apparatus, cookers, water heaters and consumers' meters. (September 21st.)

Heston and Isleworth.—October 17th. Electricity Department. Transformer kiosks, underground distribution network boxes, and two 300-kVA transformers. (See this issue.)

Horwich.—U.D.C. October 12th. Electrical equipment. (See this issue.)

India.—DELHI.—October 30th. Stores Department. Grid sub-station and local distribution sub-station, switchgear. (A.Y. 12637.)* Switchgear for the Quadian electric supply project. (A.Y. 12656.)*

Leek.—October 8th. U.D.C. Electrically driven borehole pump with automatic control equipment, Venturi meter, crane and lighting and heating apparatus. Specifications from Clerk, Town Hall (deposit £3).

London.—COMMISSIONERS OF WORKS.—October 11th. Electric wire and cable. (September 28th.)

LEYTON.—October 10th. Electricity Department. Two 500-kVA transformers and l.p. a.c. switchgear. (September 28th.)

Manchester.—October 10th. Corporation. Three-phase. 6,600-V switchgear (sheet steel cubicle type) for two years. (September 28th.)

Electricity Committee. October 10th. A.c. electric fan motors. (September 28th.)

New Zealand.—WELLINGTON.—November 1st. Posts and Telegraph Department. Dynamo sets. (A.Y. 12592.)

Pudsey.—October 8th. Electricity Department. H.p., l.c., p.i. and steel tape armoured cable during the period ending March 31st, 1935. (September 28th.)

Shipley.—October 17th. Electricity Department. 11,000-V cable. (September 21st.)

South Africa.—CAPE TOWN.—October 31st. Electricity Department. Overhead line material. (G.Y. 14346.)*

Stoke-on-Trent.—October 10th. Electrical Engineer's Department. Replacement lead battery for electric vehicle. (September 28th.)

Swansea.—October 22nd. Electricity Department, Apparatus for the remote and automatic control of four pulverised fuel-fired boilers, each having a rating of 240,000 lb. per hour, together with the necessary instruments, &c., Section "V," at the Tir John power station. Specifications, forms of tender, &c., from Preece, Cardew & Rider, consulting engineers, 8, Queen Anne's Gate, S.W.1 (deposit £2 2s.); tenders to H. L. Lang-Coath, town clerk, Town Hall, Stockport.

October 26th. E.h.p. and l.p. cables. Section "S," together with supports, pipes, trenching, &c., and the making of 400 cable boxes. (September 28th.)

Walton and Weybridge.—October 17th. Electricity Department. Transformers, kiosks and switchgear, l.p. feeder pillars and e.h.p. feeders. (See this issue.)

Warrington.—October 19th. Whitecross Institution Committee. Electric motor at the Institution laundry. Particulars from borough surveyor.

Worthing.—October 8th. Borough Council. E.h.p. and l.p. switchgear. (September 28th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35 Old Queen Street, S.W.1.

Contracts Closed

Aberdeen.—Electrical work at Walker Road school (£897).—A. B. Robertson & Son, Ltd.

Ayr.—County Council. Accepted. Electrical work at 150 houses at Stevenston (£1,196).—D. A. McLarty.

Bedford.—Electricity Committee. Recommended. Switchgear for sub-stations: Denmark Street (£229).—Crompton, Parkinson, Ltd. Castle Lane (£123).—British Thomson-Houston Co., Ltd. Stores for twelve months: Cut-outs.—W. T. Henley's Telegraph Works Co., Ltd. Meters.—Chamberlain & Hookham, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Ferranti, Ltd. Meter boards.—W. H. Holland. Kettles.—Drake & Gorham, Ltd. Cable covers.—H. J. Baldwin. Cooker control units.—General Electric Co., Ltd.; Revo Electric Co., Ltd. Water-heaters.—Johnson & Phillips, Ltd. Transformers.—British Electric Transformer Co., Ltd.

Electricity Committee. Accepted. Street-lighting material.—Revo Electric Co., Ltd.

Cardiff.—Electricity Committee. Accepted. 33,000-V cable (£10,622).—Pirelli-General Cable Works, Ltd. 33,000-V switchgear (£14,470), bus-bars (£399 each) and oil selectors (£756 each).—General Electric Co., Ltd. 15,000-kVA transformers.—Hackbridge Electric Construction Co., Ltd. (£11,350); Metropolitan-Vickers Electrical Co., Ltd. (£11,350). Main switchgear (£2,008) and metering panel (£244).—British Thomson-Houston Co., Ltd. Switchgear for Colum Terrace sub-station (£144).—Ferguson Pailin, Ltd. Voltage regulation equipment (£105).—Fuller Electrical Manufacturing Co., Ltd.

Glasgow.—Streets Committee. Accepted. Traffic signals at Kilmarnock Road (£700).—Automatic Electric Co., Ltd.

Transport Committee. Accepted. Two water tube boilers at Pinkston power station (£51,376).—John Thompson Water Tube Boilers, Ltd.

Isle of Wight.—County Roads Committee. Recommended. Electric signalling apparatus at Yar Bridge (£535).—Automatic Electric Co., Ltd.

Johnstone.—Housing Committee. Accepted. Electrical work at Thorn Brae housing scheme.—E. Gillespie.

London.—ST. PANCRAS.—Contracts and Stores Committee. Recommended. Meter boards for a period of ten months from October 1st, 1934.—Lighting, Heating & Traction Supplies Co. Switchgear for Arlington Road sub-station.—General Electric Co., Ltd.; A. Reyrolle & Co., Ltd. Transformers.—General Electric Co., Ltd.

BERMONDSEY.—Electricity Committee. Recommended. Four panel switchboard (£596) and one panel switch (£140).—A. Reyrolle & Co., Ltd. Transformers (£863).—British Electric Transformer Co., Ltd.

EAST HAM.—Electricity Committee. Recommended. Electric van and charging plant (£240).—Tomlinson, Ltd. Telephone exchange board (£261).—Standard Telephones & Cables, Ltd.

HAMMERSMITH.—Electricity Committee. Recommended. Six 150-kW transformers (£829).—British Electric Transformer Co., Ltd.

HACKNEY.—Housing Committee. Accepted. Electric lighting at Newcombe House extension (£216).—F. H. Wheeler.

Electricity Committee. Accepted. 1,500-kW convertor at Millfields Road sub-station (£3,697).—Bruce, Peebles & Co.

Works Committee. Accepted. Electric vehicle battery (£232).—Chloride Electrical Storage Co., Ltd.

FINCHLEY.—Highways Committee. Recommended. Automatic traffic singals at Great North Road (£577).—Automatic Electric Co., Ltd.

FULHAM.—Electricity and Lighting Committee. Recom-

mended. Switchgear.—W. Lucy & Co., Ltd. (£266); Ferguson, Pailin, Ltd. (£414).

Establishment Committee. Accepted. Alterations to the electrical installation at the baths and wash-houses (£630).—Piggott Bros. & Co., Ltd.

Barking.—Electricity Committee. Accepted. Switchgear (£248).—A. Reyrolle & Co., Ltd.

Recommended. Test room equipment (£387).—Metropolitan Vickers Electrical Co., Ltd.

Croydon.—Hospitals Committee. Recommended. Repairs, &c., to electric battery at mental hospital (£623).—Tudor Accumulator Co., Ltd.

Health Committee. Recommended. X-ray apparatus at Mayday Hospital (£3,049).—Solus Electrical Co.

Electricity Committee. Recommended. Switchboard extensions (£392).—Ferguson, Pailin, Ltd. Reconditioning works battery (£168).—Alton Battery Co. 1,000-kVA transformer (£452).—British Electric Transformer Co., Ltd.

Manchester.—Electricity Committee. Accepted. Reblading turbo-alternator at Stuart Street power station.—Richardsons, Westgarth, Ltd.

Education Committee.—Accepted. Electrical installations at Haveley Heys school.—Broughton & Irlam Electrical Engineering Co. Electrical installations at Grange Street school.—J. Collier & Co.

Mansfield.—Health Committee. Accepted. Two electric vehicles.—General Vehicle Co., Ltd.

Tynemouth.—Electricity Committee. Accepted. Transformers (£449).—C. A. Parsons & Co., Ltd. Cable (£268).—Macintosh Cable Co.

Housing Committee. Electrical installation at 306 houses on Ridges estate (£1,106).—Bonham Electrical Engineering Co.

Wolverhampton.—Electricity Committee. Accepted. Switchgear (£168).—Ferguson, Pailin, Ltd. Transformer (£80).—Electric Construction Co., Ltd. Switchboard (£161).—Crompton Parkinson, Ltd.

Forthcoming Events

Junior Institution of Engineers.—Friday, October 5th. 39, Victoria Street, S.W.1. 7.30 p.m. Informal meeting. "Random Notes on Engineering Developments in Sweden." Mr. C. H. G. Aston.

Electrical Power Engineers' Association (*Southern Division*).—Saturday, October 6th. Holborn Restaurant, W.C.1. 5.30 for 6 p.m. Annual dinner. (*Manchester Section*).—Saturday, October 13th. Grand Hotel, Manchester. 6.30 p.m. Social evening and dance.

Illuminating Engineering Society.—Tuesday, October 9th. Lighting Service Bureau, W.C.2. 6 p.m. Presidential address by Mr. H. Hepworth Thompson. Thursday, October 11th, Assembly Rooms, Birmingham. 7 p.m. "Reviewing Progress in Illumination." Mr. C. W. Sully.

Edinburgh Electrical Society.—Wednesday, October 10th. Philosophical Institution, Edinburgh. "The Cathode-ray Oscillograph." Professor Say.

Electrical Association for Women.—Wednesday and Thursday, October 10th and 11th. 20, Regent Street, S.W.1. 3 p.m. "Table Cookery for Kitchenette and Dining Room." Miss D. Vaughan.

Institution of Engineers and Shipbuilders in Scotland.—Friday, October 12th. Grosvenor Restaurant, Glasgow. "James Watt" dinner.

Institution of Welding Engineers (*North-Western Branch*).—Friday, October 12th. Bacup and Rawtenstall Technical School, Bacup. 7.15 p.m. "Resistance Welding." Mr. P. R. Dunn.

Association of Supervising Electrical Engineers.—Saturday, October 13th. First Avenue Restaurant, W.C.1. 6.30 p.m. Dinner and dance.

Notes

The E.A.W. Speakers' Course

The Speakers' Lecture Course arranged by the Electrical Association for Women was held from September 26th to 28th at King's College of Household and Social Science. On the evening of the first day a dinner was given at which Lady Moir (president) took the chair. The toast of "Electricity in the Service of Women" was proposed by Mr. J. M. Kennedy, who said that only about four million (out of twelve million houses) were wired and one-tenth of them used electricity for cooking. Tariffs should be such that even those on the dole or in receipt of public assistance should use electricity. The reduction in the use of raw coal for domestic purposes would do much towards getting rid of smoke, even if legislation did not make it compulsory within our time. Response on behalf of country women was made by Mrs. L. K. Huxley (National Federation of Women's Institutes), who said that the prices charged for lighting public halls in Buckinghamshire varied from 9d. to 1d. per kWh. There were 90,000 women engaged in agriculture, apart from farmers' wives. She mentioned that in Preston a special poultry-farm rate was in force. Her organisation had received considerable help from the E.A.W. in replying to questions about electricity. In seconding the response, Miss Cécile Matheson (National Council of Women) spoke for the townswoman, suggesting that one of the most important tasks of the E.A.W. was to overcome the fear of electricity in the consumer; non-standard voltages were also an obstacle.

Mrs. D. W. Newman (chairman, Bristol Branch, E.A.W.), who proposed the health of the guests, commended women's institutes in modernising the outlook of their members. Response was made by Mr. J. C. Dalton (Provincial Electric Supply Association). "The Chairman and the E.A.W." was toasted by Sir Wm. Ray (executive chairman E.D.A.), who expressed his belief that we were at the beginning of a new phase of intensive development. Lady Moir, in reply, spoke of the Sydney branch of the E.A.W. (with over 1,000 members) which was to be visited by the Dowager Lady Swaythling (hon. treas. E.A.W.), who also spoke briefly. Miss C. Haslett (director, E.A.W.), said that the Speaker's Course had been arranged because women's organisations often applied to the E.A.W. for lecturers and there were not enough of them available. For the present course sixty-nine students had enrolled from all points of the country.

A local branch of the Electrical Association for Women has been formed at Stafford, with Lady Beatrice Ormsby-Gore, wife of the M.P. for Stafford, as president, and the Countess of Harrowby as vice-president. Mrs. E. M. South is the chairman, and the joint secretaries are Mrs. J. Kirkwood, of Radford Bank, Stafford, and Miss E. Peatfield, of 72, Wolverhampton Road. Mrs. S. Robinson, the Mayoress, is interesting herself in the movement.

Flame-resisting Cables and Rubber

The extensive use of rubber as an electrical insulating material lends importance to any process which is likely to reduce its inflammability. Imperial Chemical Industries, Ltd., suggests that by the incorporation of its new high-melting point non-brittle grades of "Seekay" wax it is now possible to obtain a satisfactory rubber-like material suitable for applications in which it is desired to reduce fire hazard to the minimum. Rubber so treated, while not being rendered actually non-inflammable, becomes flame-resisting to a marked degree.

"Seekay" wax is a synthetic product, manufactured by the controlled chlorination of naphthalene, and in a number of grades covering a wide range of melting-points. In appearance, and also in so far as water-resisting and insulating properties are concerned, these synthetic waxes resemble natural waxes, but they are non-inflammable, and can be obtained with various melting points as high as 125 deg. C.

Methods of rendering a rubber cable flame-resisting have not been easy to find. Wool instead of cotton braid has been employed, non-inflammable paints have been used to saturate the braid, and asbestos has in some cases been incorporated in the cable covering, but the use of "Seekay" wax as an impregnant instead of paraffin waxes for saturating the braid of fabric-covered cables results in the depression of the inflammability, and enables a flame-resisting mixture to be used for the outer covering of rubber-sheathed cable. It can be used equally well in place of bitumen for the fabric cover of the outside of lead-sheathed cable.

"Seekay" wax is not expensive to use and its incorporation in a cable does not, it is said, result in an increase in cost at all in proportion to the benefits derived. In addition to conferring flame-resistance, "Seekay" wax is water-resistant and prevents braid-slip on braided cables. This substance and its properties were the subject of a demonstration by the I.C.I. in London on Tuesday last.

Water Treatment

A thirty-six page book on the care of modern steam generating plant on the water side has been published by Messrs. Babcock & Wilcox, Ltd., under the title of "Water Treatment." Like that valuable production of the same firm, "Steam," it provides a clear and thorough technical exposition of its subject, from a description of the common impurities and a consideration of approximate means for determining the amount of reagent required for softening feed water. Methods of treatment under different conditions and of testing (qualitative and quantitative) water for various compounds are given in detail and especial reference is made to the requirements of boilers for 600 lb. per sq. in. and above.

Institute of Fuel

The annual dinner of the Institute of Fuel will be held at the Connaught Rooms, Great Queen Street, W.C., on November 12th. Prince George has accepted an invitation to attend and will propose the toast of the Institute. The Melchett Medal will be presented to Dr. Bergius immediately after the dinner.

Appointments Vacant

Telegraph engineer for the Posts and Telegraphs Department, Federated Malay States.

Technical assistant for the Ipswich Consumers' and Installation Department (salary £407 per annum).

Chief technical assistant for the Stepney Electricity Department (salary £800, rising to £1,000 per annum).

Temporary charge engineer for the Canterbury Electricity Department.

Temporary mains assistant for Bromley Corporation Electricity Department.

Assistant executive engineer in the United Provinces Service of Engineers, India.

(See our classified advertisements.)

Makers' Names Wanted

Twinlite parchment shades.

O.K. batteries.

Bruca's patent "irreversible" spring switches

Genii vacuum cleaner.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. H. A. Howie, borough electrical engineer to the Walsall Corporation, was presented last week with a number of gifts on the occasion of his retirement on superannuation. At a gathering at the Transport Social Club employés of the Department presented him with an inscribed gold watch. The presentation was made by Mr. D. Mills (commercial assistant). It was recalled that the formation of the Department's Welfare Committee was due to Mr. Howie, who presented a cup as a perpetual sports trophy. On Thursday evening last week Mr. and Mrs. Howie were entertained at a supper and dance in the Kenmare Café.

Mr. F. E. Brewer has severed his connection with Radio Instruments, Ltd., with whom he has been for the past five and a half years in the capacity of sales manager, and is now associated with Messrs. F. E. Brewer & Co., manufacturers' agents and engineers, whose address is 68, Wansey Street, London, S.E.

Mr. R. H. Holbeche has resigned from the English Electric Co., Ltd., for whom he had charge of motor sales for London and the South, and has joined the staff of Messrs. M. W. Woods, Ltd., of Colchester, as sales manager. Mr. Holbeche received his training at the works of Messrs. Crompton & Co., Ltd., Chelmsford, over a period of five years. After two years in the works of Messrs. Vickers, Ltd., Sheffield, he joined the Birmingham offices of the English Electric Co., Ltd., and for ten years was their Leicester representative. He was chief of motor sales for the Manchester office of the English Electric Co., Ltd., for two years before being appointed to a similar position in the company's London office in 1933.

Mr. R. H. Holbeche

Mr. G. W. Duncan has resigned his appointment as publicity manager of the London Passenger Transport Board. Mr. W. Gott, commercial advertising officer (Railways) and Mr. H. L. Spratt, commercial advertising officer (Buses and Tramways), will continue to be responsible for their respective sections of the Publicity Department. Mr. H. T. Carr will be acting publicity manager and responsible for the remainder of the work of the department.

Mr. George Ellison and **Mr. Alfred Ellison,** of Messrs. George Ellison, Ltd., have arrived in South Africa, on business, after a nine-days' flight in their own acroplane.

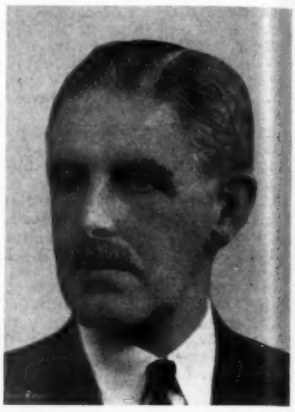
Members of the electricity supply, contracting, and manufacturing branches of the electrical industry will be interested to learn that the engagement has been announced of **Mr. J. Selley,** sales engineer with Venner Time Switches, Ltd., to **Miss Hilda Polden,** youngest daughter of Mr. F. C. Polden, of Messrs. Francis C. Polden & Co., Ltd.

Mr. J. Selley

It was announced this week that under the Order in Council dated February 6th, 1928, the Lord President of the Council of the Department of Scientific and Industrial Research has appointed Sir John Cadman and Sir James H. Jeans to be members of the Advisory Council to the Committee of the Privy Council. Sir Arthur Balfour, Bt., Sir William H. Bragg, O.M., and Lord Rayleigh have retired on the completion of their terms of office.

Mr. W. T. Buswell, who for the past twenty-four years has been with Messrs. Francis Polden & Co., Ltd., has relinquished his position with that company. During the past ten years he has been responsible for the estimating, buying, and supervision in connection with many large and important contracts. Mr. Buswell's present address is "Alvida," Shakespeare Road, Mill Hill, N.W.7.

Dr. Percy Dunsheath, O.B.E., M.A., who has been appointed chief engineer of Messrs. W. T. Henley's Telegraph Works Co., Ltd., is more especially known to our readers for his contributions to the development of cable technique during the past few years to meet the demand for higher voltages. He will be remembered not only for his papers on the subject, but for his substantial contributions to discussions on papers by other engineers. He is a member of the Council of the Institution of Electrical engineers, by which body he has been awarded the Kelvin and the John Hopkinson premiums. Originally trained for civil engineering at Sheffield University, Dr. Dunsheath later turned to electrical work. He obtained a first-class honours degree in engineering at London University and proceeded to Cambridge, where, as an advanced student, he took a "first" in the Mechanical Science Tripos. After a distinguished war service with the Royal Engineers, being twice mentioned in dispatches, he was awarded the O.B.E. (Military). He joined Henley's in 1919 to take control of the newly formed Research Department; the Henley research laboratories at Gravesend were planned under his supervision. Five years ago he was appointed research and technical manager, a position he has held until his new appointment. The degree of D.Sc. (Engineering) was conferred upon him by the Senate of the University of London in 1933.



[*Lafayette*

Dr. P. Dunsheath

Mr. G. A. Robertson has been appointed deputy borough electrical engineer to Preston Corporation. He served his apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., and Messrs. W. T. Glover & Co., Ltd., and holds the degrees of Bachelor of Technical Science and Master of Technical Science of Manchester University. During the last four years he has acted as chief technical assistant to his father, Mr. J. A. Robertson, consulting engineer, of Manchester, and in this capacity has had a wide technical and commercial experience in all matters relating to electricity supply undertakings. Mr. Robertson is an associate member of the Institution of Electrical Engineers and has contributed several articles to the technical Press.

Mr. G. A. Robertson

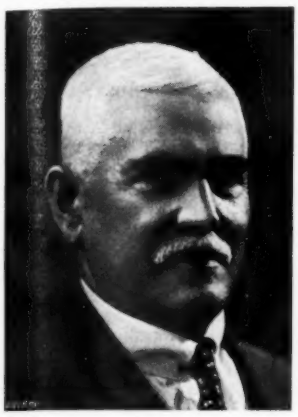
Colonel Crompton as a Film Star!—No! we are not indulging in a flight of the imagination, for the Colonel has actually, at the youthful age of eighty-nine, been making a talkie. He is the subject of the first of a series of short films of famous scientists which Gaumont-British Instructional Films are producing. We are assured that the Colonel was quite at home in the glare of the arc lamps, and what is more appropriate remembering his early work in this line. He also, we learn, spoke clearly and well, telling with pride of his early electrical installation work in the 1880's and 1890's. His remarkable activity is often in evidence at Bush House, where he attends board meetings of Crompton-Parkinson, Ltd.

Mr. W. H. Taylor, general manager of the West Australian Government Tramways and Electricity Supply, has returned after a business visit to England. He was in this country for about six months, making investigations in connection with the plant required for the extensions to the East Perth power house. Owing to the complex nature of the tenders consideration was delayed until his return.

The Council of the Institute of Transport informs us that it has made a number of premium awards in respect

of the session 1933-34. These include the following:—Railway Operating Medal: Mr. C. M. Jenkin Jones, for his paper on "Railway Colour Light Signalling from an Operating Point of View." Road Transport (Passenger) Medal: Mr. G. F. Sinclair, for his paper on "Regeneration as Applied to Direct Current Electric Traction."

Mr. **A. E. White,** A.M.I.E.E., retired from the Post Office Engineering Department on October 1st after over forty years' service. He was the sectional engineer in charge of the Manchester East Section, and during the last few years has been in charge of the external cable rearrangements in connection with the conversion of the Manchester telephone area to automatic working.



Mr. A. E. White

Mr. C. Backhouse, sales manager of Messrs. H. Birdsall & Co., Ltd., has been appointed to the board of Briton Lamps, Ltd., a company recently formed to take over the electrical department of Messrs. H. Birdsall & Co. **Mr. G. Mansell,** of the Lamp Sales Department of Messrs. John Ismay & Sons, Ltd., has also joined the board of the company, while **Mr. A. Claremont,** the principal outside representative of Messrs. H. Birdsall & Co., will also be associated with the new organisation.

Mr. R. M. W. Grant, the author of the article on "Static Balancers," which appears on page 440, graduated at Glasgow University in April, 1928, with first-class honours in electrical engineering (B.Sc. degree), and in the same year joined Messrs. Johnson & Phillips, Ltd., as a student apprentice On the completion of his apprenticeship he continued in the service of the company as transformer engineer in the design section.

Mr. J. D. Spark, who has been appointed to succeed the late Mr. A. W. Blake as borough electrical engineer and manager at Willesden, was born and educated at Aberdeen, where he also served an apprenticeship in mechanical and electrical engineering with his father, well known as one of the pioneers in the electrical world in the north of Scotland. His technical training was obtained at Robert Gordon's College, Aberdeen. His first appointment in the supply industry was at the Aberdeen electricity works. From there he was appointed second assistant at Northampton. Other appointments which he has held were at Croydon, Swansea, and Walsall. Early in 1920 he went to Willesden as deputy chief electrical engineer. He is an associate member of the Institution of Electrical Engineers, a past president of the Chief Technical Assistants' Association, and a national trustee of the Electrical Power Engineers' Association. Mr. Spark has conducted classes in electrical engineering at Walsall and Harrow Technical Schools. He is the youngest of a family of electrical engineers: his eldest brother held an important position for many years as designer for Mr. Henry Ford at Detroit. His other brother is chief electrical engineer at Bath.

[*Lafayette*

Mr. J. D. Spark

Mr. **J. McLaren,** B.Sc., A.M.I.E.E., was married on September 15th, at St. Mary's Church, Leigh, Kent, to Miss Rena Dorothy Cooke.

Mr. **A. J. Fuller,** the borough electrical engineer of Fulham, who reaches the retiring age of sixty-five years in January next, has informed the Electricity and Lighting Committee that, in view of the state of his health, he desires to be relieved of the control of the electricity undertaking on that date. He is prepared to act in an advisory capacity for the undertaking, including the organisation of the staff and the stores, and the starting to work and operation of the new power station. Full reference was made here to the position of Mr. Fuller when a new agreement was entered into several years ago and was referred to again in our issue of February 24th, 1933. Under the terms of his existing agreement Mr. Fuller will continue to act as joint consulting engineer for the construction of the new station until October, 1936. The Committee has recommended that Mr. Fuller be retained for a period of two years from the date of his retirement as consultant adviser for the whole of the electricity undertaking, including the starting to work and operation of the new power station, and that he be paid an inclusive fee of 2,000 guineas in respect of such services. **Mr. H. Clarke,** the resident engineer for the construction of the new station, has been recommended for the appointment of chief generation engineer of the existing power station and of the new one, as from July next, at a salary of £1,350 per annum, rising to £1,750. When the work on the site of the new power station was commenced the Fulham Council released Mr. Clarke to enable him to take up the appointment of resident engineer, under Messrs. Preece, Cardew & Rider, on the understanding that he would be reinstated at the termination of his duties with the consulting engineers. His services in his new appointment will be required not later than July 1st, 1935. The Law and Parliamentary Committee has recommended that **Mr. W. C. Parker,** the assistant borough electrical engineer, be appointed borough electrical engineer as from January 11th next, at a salary of £1,500 per annum, rising to £2,000. The recommendations were to come before the Fulham Council at its meeting held on Wednesday last.

Mr. J. W. Howell, who writes on "Good Industrial Lighting" (page 443) is industrial lighting specialist at the E.L.M.A. Lighting Service Bureau, a position which he has occupied for the past eighteen months. Mr. Howell received his technical education at Loughborough College, being awarded the diploma in the Faculty of Electrical Engineering. For ten years he served with the General Electric Co., Ltd., at the company's Witton works, Birmingham, as an engineering draughtsman, and later he was for a short period assistant to Mr. F. W. Ayers, industrial consultant on factory planning and reorganisation work, Birmingham.

[*Jerome*

Mr. J. W. Howell

Mr. W. F. Bartram, M.I.E.E., of Power & Lighting Cables, Ltd., has taken up the London agency of the Ray Engineering Co., Ltd., for switchboards, rectifiers, resistances, control gear, &c.

Mr. Samuel Insull and sixteen of his former colleagues interested in the conduct of some fifty public utility companies appeared in the United States District Court at Chicago on Tuesday, October 2nd, in reply to the charge of having used the mails to defraud investors of about £28,600,000. Press reports state that Mr. Insull, who was seated beside his son, who is among those charged, was looking better than he had done for some time past. It has taken two years to prepare the case, and a battle of statistics is predicted, lasting possibly four months. Tuesday was devoted to enrolling the jury.

Mr. R. H. Harral, deputy electrical engineer and manager of the Blackburn Corporation electricity undertaking, has been recommended by the Corporation Electricity Committee for the position of electrical engineer and manager, to fill the vacancy caused by the appointment of Mr. W. A. Royle to a similar position with the Sunderland Corporation. Mr. Royle will conclude his duties at Blackburn on December 1st. The proposed salary is £850 per annum, rising to £1,000. Mr. Harral received his early training at Blackburn Technical College, and was engaged in the Blackburn Electricity Department from 1908 to 1915. Later he was appointed senior assistant on the mains staff of the Yorkshire Electric Power Co., at Leeds, returning to Blackburn in 1929 as mains superintendent. He performed useful service in training a school of jointers to cope with the work of cable laying which was previously done by a firm of cable makers. This work is now carried out by a special staff. He was appointed deputy electrical engineer in October, 1933. The Electricity Committee has also recommended that advertisements should be issued for an assistant engineer.

Mr. R. H. Harral

Mr. W. J. Jeffries, of Woodseaves, Manor Way, Petts Wood, Orpington, late office and stores manager at Deptford East power station, was presented with a silver tea set and tray on September 25th by his past and present colleagues on the occasion of his retirement after forty-seven years' service. Mrs. Jeffries received a gold wrist-watch. The presentation was made by Mr. A. Hamilton Ellis, chief superintendent engineer, in the presence of a large company of past and present employés, the former including Mr. M. Feetham, late chief constructional engineer of the London Power Co. and for twenty-seven years superintendent engineer at the East Station. Mr. Jeffries gave an interesting *résumé* of the early history of the old Deptford power station, his association with those engineers who had to carry the burden of the early pioneer troubles, and of the gradual progress to the success it had attained when taken over by the London Power Co. Mrs. Jeffries also thanked the donors in grateful terms.

Mr. Jeffries commenced his career with the London Electric Supply Corporation in 1887, which at that time had started operations at the Grosvenor Galleries. He was in contact with the late Dr. Ferranti, with Mr. G. W. Partridge, and others associated with them in the pioneer work. When the Deptford Station was started he was transferred to Deptford and was closely in touch with the details of the original 10,000-V plant laid down there, and with the manufacture of the first Ferranti concentric mains which were made on the site, and were in service on the transmission to the London sub-station until quite recently. Since then he has been intimately associated with the various vicissitudes and developments of the station into the modern and up-to-date equipment which it now represents.

Obituary

Mr. W. S. Guilford, a well-known South African consulting electrical engineer, has died at his residence in Rondebosch, near Cape Town. He was born in Scotland and was taken to South Africa as a child. He was educated at St. Andrew's College, Grahamstown, and afterwards at Owens College, Manchester, where he qualified as an electrical engineer. Returning to South Africa, he held several important positions. At one time he was chief electrical engineer of the Springs Mines, and he was town engineer of Boksburg, where he installed the first electric trolley-buses in South Africa. Later, as a consulting engineer, he supervised the electrical installations in a number of towns, including Grahamstown, Oudtshoorn, Kuruman, and Gordon's Bay. Some years ago he settled in the Cape Peninsula, for health reasons, and established himself as a consulting electrical engineer, and a few months ago was appointed South African agent for a Continental electrical firm.

Mr. C. Clayton-Gallop, representative in the Far East of Messrs. A. Reyrolle & Co., Ltd., Hebburn-on-Tyne, died in a Newcastle nursing home on Sunday, at the age of forty-nine. Mr. Clayton-Gallop was in England on leave and intended to return to Shanghai this month.

Mr. G. E. Gibson.—We regret to record the death of Mr. George E. Gibson, which occurred on September 27th after a short illness at his home in Canterbury. Mr. Gibson was for over thirty years the representative of Messrs. J. H. Tucker & Co., Ltd., in the Southern counties.

Mr. H. Varnom.—The death occurred recently of Mr. H. Varnom, a director of the Donovan Electrical Co., Ltd. He had been associated with the company and its predecessor, Donovan & Co., since its foundation thirty years ago. The interment took place on September 25th at Lodge Hill Cemetery, Birmingham.

Mr. W. H. Nichols, manager of the Engineering Department of Messrs. W. T. Henley's Telegraph Works Co., Ltd., who was taken suddenly ill while at his office on September 20th, died at his home, "Garthowen," Harvines Road, Amersham, Bucks, on October 1st. He was sixty-four years of age and had been in Henley's service since January, 1892, commencing as a junior at head office. He was transferred to Woolwich works in 1895, and five years later was appointed chief of the Estimating Department there. In 1903 he became chief of the Contract Estimating Department, and was appointed manager of the Joint Box Department in February, 1906. This department later became the Engineering Department, and was successfully managed by Mr. Nichols throughout its existence. Mr. Nichols had served on a number of committees connected with the electrical industry, chief among which were those of the B.E.A.M.A. and the B.S.I. Mr. Nichols, who was a founding member of the "Argosy" Lodge of Freemasons, was a man who, in an unobtrusive way, did an enormous amount of work for the electrical industry. He was a leading authority on service cut-out design, and his ability in the design and production of electrical-distribution equipment in no small measure helped in the rapid progress of electrical development. The funeral takes place to-day (Friday) at the Parish Church (St. Mary's), Amersham-on-the-Hill, at 11.15 a.m.

The late Mr. W. H. Nichols

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

D.Y. Switch Co., Ltd.—Private company. Registered September 27th. Capital, £500 in £1 shares. Objects: To acquire the businesses carried on at 67a, Kelvin Road, Highbury, N.5, as "Barn Electrical Services" and "D.Y. Switch Co.," and to carry on the business of electrical contractors, switch manufacturers, wireless aparatus dealers, &c. The directors are: C. W. V. Davis and E. R. Davis, both of 54, Park View, Winchmore Hill, N.21. Registered office: 67A, Kelvin Road, Highbury, N.5.

Irish Driver Harris Co., Ltd.—Private company. Registered in Dublin, September 17th. Capital, £10,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric cable and all apparatus capable of being used in connection with the generation, distribution, supply, accumulation, and employment of electricity, &c. The first directors are: J. Drennan, Braestend, Hetbridge Lane, Prestbury, Cheshire, J. K. Cooper, Lake Vale, Alderley Edge, Cheshire, and F. L. Driver, address not stated.

T. Arthur Jones & Co., Ltd.—Private company. Registered September 29th. Capital, £1,500 in £1 shares. Objects: To carry on the business of designers and manufacturers of and dealers in wireless receivers, transmitters, resistances, batteries, accumulators, aerials, &c. The permanent managing director is J. Davies, Radio House, High Street, Clydach, Swansea. Solicitor: R. A. Jones, 21, York Street, Swansea.

B. P. Electrical Co., Ltd.—Private company. Registered September 29th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical and general engineers, motor engineers, &c. The subscribers are: H. Devereux, 175, Ramsden Road, S.W.17; and Miss B. Povey, 18, Delaune Street, Kennington, S.E.17, secretary.

Silvox Metal and Electrical Co., Ltd.—Private company. Registered September 28th. Capital, £500 in £1 shares. To carry on the business of scientific instrument makers, mechanical and electrical or automobile engineers, &c. The directors are: A. E. Rowbotham, Grove Lodge, Ashford, Middx.; and C. C. Brown, 28, St. George's Road, N.13.

Returns of Electrical Companies

S. P. Catterson & Sons, Ltd.—(A) Particulars filed of debentures, to secure not more than £1,500, authorised September 4th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital (subject as to freehold and leasehold lands, works, &c., to charge created August 31st, 1893). The amount of the present issue is £1,500. (B) Particulars filed of debentures to secure not more than £3,500, authorised September 4th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital (subject as to freehold and leasehold lands, works, &c., to charge of August 31st, 1893, debentures, &c.). The amount of the present issue is £3,500.

London Electric Wire Co. & Smiths, Ltd.—Capital, £1,250,000 in 750,000 ordinary and 500,000 7½ per cent. cumulative preference shares of £1. Return dated May 18th, 1934. 684,070 ordinary and 400,000 preference shares taken up. £350,035 paid on 35 ordinary and 350,000 preference shares, £734,035 considered as paid on 684,035 ordinary and 50,000 preference shares. Mortgages and charges, nil.

Birkdale District Electric Supply Co., Ltd.—Capital, £50,000 in £5 shares. Return dated May 25th, 1934. 9,200 shares taken up. £46,000 paid. Mortgages and charges: £25,546 4s. 8d.

Ellesmere Port Electrical Co., Ltd.—Capital, £500 in £ shares. Return dated June 15th, 1934. 450 shares taken up. £251 paid, £199 considered as paid. Mortgages and charges, nil.

Dixon Corbitt, Ltd.—Capital, £160,000 in £1 shares. Return dated July 26th, 1934. All shares taken up. £96,150 paid, £63,850 considered as paid. Mortgages and charges, £45,000.

Insulators, Ltd.—Particulars filed of £15,000 debentures, authorised August 28th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital (if any), the amount of the present issue being £4,000.

J. S. Ramsbottom & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated June 19th, 1934. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Leslie Fink, Ltd.—Mortgage for £647 5s. 10d., dated November 9th, 1933, charged on four houses in Bury Road, Rochdale

(being properties acquired by the company on September 17th, 1934). Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagees: Leeds Permanent Building Society.

Tamworth District Electric Supply Co., Ltd.—Particulars filed of £34,000 debentures, authorised September 17th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £20,000.

Rhondda Tramways Company, Ltd. (Now Rhondda Transport Company, Ltd.).—Charge, on the company's earnings dated July 18th, 1934, to secure £3,500 per annum, payable from August 1st, 1933, to August 1st, 1949. Holders: Rhondda Tramways Electric Supply Company, Limited, 88, Kingsway, W.C.2. (The above is in priority to the debenture or debenture stock obligations for the time being of the company).

Rhondda Tramways Electric Supply Co., Ltd.—Trust deed, dated July 18th, 1934 (supplemental to deed dated August 8th, 1907, and deeds supplemental thereto, securing £70,000 debentures). Property charged: Rent charge of £3,500 per annum, payable by the Rhondda Tramways Company, Ltd., from August 1st, 1933, to August 1st, 1949, to the company. Trustees: R. Williams, Newnham Hall, nr. Daventry; and G. L. Schlesinger, 31, Throgmorton Avenue, E.C.2.

Metropolitan Rediffusion Services, Ltd.—Particulars filed of debentures to secure £1,200 and a premium of 2½ per cent., authorised September 13th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £500.

Mitchell Electric Co., Ltd.—The nominal capital has been increased by the addition of £1,500 beyond the registered capital of £500. The additional capital is divided into 750 6 per cent. preference and 750 ordinary shares of £1 each.

Brandes, Ltd.—Capital, £20,000 in £1 shares. Return dated December 31st, 1933 (filed May 16th, 1934). All shares taken up. £10,392 paid. £9,608 considered as paid. Mortgages and charges, nil.

Minehead Electric Supply Co., Ltd.—Capital, £85,000 in 16,000 preference and 69,000 ordinary shares of £1. Return dated May 4th, 1934. All shares taken up. £83,027 paid on 16,000 preference and 67,027 ordinary shares. £1,973 considered as paid on 1,973 ordinary shares. Mortgages and charges, nil.

A. Hirst & Son.—Capital, £20,000 in 100 preference and 1,900 ordinary shares of £10 each. Return dated June 1st, 1934. 100 preference and 1,220 ordinary shares taken up. £2,200 paid on 100 preference and 120 ordinary shares. £11,000 considered as paid on 1,100 ordinary shares. Mortgages and charges, nil.

Dalgetti Electric, Ltd.—Capital £500 in £1 shares. Return dated June 7th, 1934. 150 shares taken up. £150 considered as paid. Mortgages and charges, nil.

Colombo Electric Tramways & Lighting Co., Ltd.—Capital, £150,000 in £10 shares. Return dated June 12th, 1934. 13,084 shares taken up. £840 paid. £130,000 considered as paid. Mortgages and charges, nil.

Strange & Sons Electrical Engineering Co., Ltd.—Memorandum of deposit dated September 15th, 1934, charged on land at Fairlight, near Hastings, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £500.

Neutron (1927), Ltd.—Wm. G. Howell, 9, New Square, Lincoln's Inn, W.C.2, was appointed receiver and manager on September 26th, 1934, under powers contained in debenture dated June 15th, 1934.

Burgoyne Wireless (1930), Ltd.—The nominal capital has been increased by the addition of £2,000 in £1 ordinary shares beyond the registered capital of £500.

Kamroe Radio Co., Ltd.—Debenture dated September 18th, 1934, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Miss R. Bilantz, 96, Christchurch Avenue, Brondesbury, N.W.6.

Insulex, Ltd.—K. D. Hutton, of 407/409, Moorgate Station Chambers, E.C., was appointed receiver on September 7th, 1934, under powers contained in debenture dated February 25th, 1932.

Frank & Bazin, Ltd.—R. Y. Rickard, of Royal London House, Finsbury Square, E.C., ceased to act as receiver and manager on September 14th, 1934.

City Notes

The Mexican Light Power Co., Ltd., and the **Mexican Tramways Co.** held their annual meetings on October 1st, when Mr. W. Gow, vice-president of both companies, who presided, in referring to the electricity supply company, said that the two principal reasons for the decreased earnings of the company down to the end of the period under review were the decline in the value of the Mexican peso and the imposition by the authorities of increased taxes in Mexico. Referring to the recent arbitrary and drastic reductions in rates imposed upon the company by the Mexican Government, it was estimated that based on the position as it existed at the end of 1933, these reductions would represent a diminution of upwards of 4,000,000 pesos in the future earnings of the company. It was, of course, hoped that the losses owing to the reductions would be somewhat compensated for by an increased load and a certain readjustment of rates. Regarding the tramways company, the compromise and arrangement made with the company's first and second bondholders and with the debenture holders had been practically completed.

The Prussian Electric Co. has announced that, at the annual general meeting held in Berlin on September 27th, a resolution was passed reducing the share capital from Rm. 155,000,000 to Rm. 110,000,000. *The Times* states that, in conjunction with the reduction of the share capital, the book value of the company's fixed assets is being reduced by Rm. 18,000,000 to Rm. 106,500,000, and the book value of its participations by Rm. 11,000,000 to Rm. 121,700,000, while Rm. 17,647,696 is written off in connection with the taking over of the debts of Braunkohlen Schwelkraftwerk, Hessen-Frankfurt ("Hefrag").

The Parsons Marine Turbine Co. reports a trading profit of £9,437 for the year ended June 30th last, as against a loss of £3,026 in the preceding year. Investment income amounted to £13,568 (against £17,146). After writing off expenditure on experimental, pioneer and development work, and directors' fees, there is a net profit of £11,123 (£10,028), which, with £30,409 brought in, makes £41,533. The dividend is maintained at 5 per cent., and £30,969 is carried forward.

The British Columbia Power Corporation reports a gross revenue for the year ended June 30th last of $12,626,674, and net revenue of $1,645,430, as compared with $1,537,147 for 1932-33. After deducting dividends on the class "A" shares for the year there is a surplus of $25,430. The report states that the volume of merchandise sales has been well maintained, and the number of electrical consumers has been increased by 1,070.

The Philips Incandescent Lamp Co. in its report for the sixteen months ended April 30th last, shows operating profits of 9,700,453 fl., as compared with 7,312,594 fl. for 1932, from which preference and ordinary dividends are deducted absorbing 7,305,332 fl. After writing off additional amounts totalling 1,100,000 fl. from vacant building sites and participations, allowing 476,893 fl. for board and management remuneration, and allocating 437,151 fl. to staff, there is an undivided balance of 381,077 fl.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary: Alliance Radio, Ltd.; Brook Radio Co., Ltd.; Cleveland Radio Co., Ltd.; Electrical & Radio Distributors, Ltd.; F.B.J. Radio Products, Ltd.; F.G.F. Electrical Co., Ltd.; "Jiffy" Electric Water Heater Co., Ltd.; Plus-Four Radio Co., Ltd.; Vesta Electrical Co., Ltd.; Willis Radio, Ltd.

Joseph Lucas, Ltd., propose to pay a final dividend on the ordinary shares of 10 per cent., making 12½ per cent. for the year. A scrip bonus of 100 per cent. was distributed a year ago, and as the total dividend for 1932-33 was 25 per cent., the payment for 1933-34 is on the same basis as last year.

The Victoria Falls & Transvaal Power Co., Ltd., proposes to redeem the whole of the outstanding 5 per cent. first mortgage debentures, whether of series "A," "B," or "C," at the rate of 110 per cent. on January 2nd, 1935.

Electric & Musical Industries, Ltd., has declared a dividend of 10 per cent. on the ordinary capital for the year ended September 30th last.

The Ebonite Container Co., Ltd., has declared an interim dividend of 4 per cent., against 2 per cent. a year ago.

The Marconi International Marine Communication Co., Ltd., has declared an interim dividend of 2½ per cent. (unchanged).

Stocks and Shares

TUESDAY EVENING.

THE important reductions just inaugurated in the charges for telephone services will make their effect more apparent with every successive Stock Exchange Settlement upon the markets of the House. At first, members hardly seemed to realise the sharp fall in costs which occurred on Monday in this week, though practice has made it clear that business after hours has been already stimulated. It is jestingly complained that the Postmaster-General has added a new terror to the life of Stock Exchange members, in that their clients have now no compunction in ringing them up at any time in the evening, the cost being trifling, and the temptation so much the more emphasised. Shares in the companies connected with the manufacture of telephone gear are in more demand than usual, and those in the equipment group have come to the front.

Telephone Manufacturers

The International Automatic Telephone Company is one of those which should benefit from the increased business that will follow upon the new telephone rates. The price of the ordinary shares is 2s. 9d. higher at 38s.; and that of the "B" deferred is up a florin at 36s. 9d. The company paid 7½ per cent. last year, and at the present prices of the shares the return is about £4 6s. 9d. per cent. on the money. The company is concerned also with the manufacture of the electric traffic controls that have recently been so extensively established. Another telephone manufacturing company is Ericsson's, the price of whose ordinary shares stands at 78s. This represents a rise of 1s. 6d. on the week and nearly 10s. a share during the past four months, but the advance is probably justified, as is also likely to prove the optimism of those who some time ago "talked" Ericsson's to £4 a share. Telephone Manufacturing are a little better at 4s. 6d., while Telephone Rentals at 8s. 4½d. show a slight decline.

Manufacturing and Equipment

The general tendency in the market for these shares has been upwards. The principal movement is a rise of 12 points in Brush Electrical ordinary, which carried the price to 45. This is on account of a substantial contract which the company has secured from the Brighton Corporation, a contract stated to be of the value of nearly £81,000. The work, it is said, will ensure employment for the engineers at Loughborough for many months. Brush stock has been alone amongst the securities of the companies engaged in the electrical manufacturing business to remain greatly below its par price for a long time past. Shareholders will hope that the new contract may represent a turning in the long lane of

misfortune to which recent annual reports have accustomed proprietors of the company. Enfield Cables ordinary are better at 88s. 9d., and Enfield Rolling Mills keep their price at 27s. Henleys are ⅛ up at 6¾. Smaller gains have been secured by British Insulated, Johnson & Phillips and Siemens; the last named have risen to £1, the same price as is quoted for Telegraph Construction shares and for India-Rubber preferred. Associated Electrical Industries ordinary have held their gain at 22s., Electric & Musical Industries ordinary remain a very lively market under the influence of British and American dealing. On Tuesday evening in this week the price at 30s. showed a loss of 2s. 3d. on the week.

Cables and Wireless

The recent spurt in the prices of Cables & Wireless stocks served to attract a little selling on the part of people who had bought lower down, and were not sorry to have this opportunity for taking a profit on the junior issues. Moreover, a committee meeting was held last week by the gentlemen unofficially appointed, after the last annual meeting of Cables & Wireless, to debate the affairs of the company. At last week's meeting one speaker quite candidly admitted that the large holding of the Globe Telegraph and Trust Company could outvote any attempt made to force the hands of the Cables and Wireless directors. The appointment of the committee does not seem to have met with unanimous approval amongst stockholders. As regards share prices, the preference is 10s. higher, while the "A" and "B" are easier. The Marconi Marine Company has announced an interim dividend of 2½ per cent. on account of 1934, payable on the 18th of this month. This is the same as the rate distributed a year ago, which was subsequently made up by the final dividend to 7½ per cent. for the year.

Electricity Supply Shares

Last week's rises of a sixpence per share in the case of most of the London electricity supply companies' ordinary shares have been maintained, without there being any further movement calling for attention. The Stock Exchange market is rather inclined to take the view that the dividends for this year will be raised by ½ per cent. to a uniform 7½ per cent., the same rate, that is to say, as the St. James' & Pall Mall dividend for last year. At the 7 per cent. rate the yield on the money at 35s. is exactly 4 per cent., which seems little enough to obtain from industrial ordinary shares, of however high a class. North Metropolitan Electrics are better at 3$\frac{7}{16}$. British Light & Power strengthened a trifle to 20s. 3d. Clyde Valley shares are a little better than they look from the official quotation, the latter being 38s. 9d., whereas actually in the market the price is nearer 39s. 6d., the shares having come into request by reason of the launching of the *Queen Mary*. Northamptons are up ⅛ at 53s. 9d. West Gloucestershire ordinary went back to 89½, after reaching 90.

Victoria Falls Power

Victoria Falls & Transvaal Power Company announces its intention of redeeming the whole of its outstanding 5 per cent. first mortgage debentures, of whichever series, at 110 on January 2nd next year. The three series are redeemable at 110 on January 2nd, 1936, or any earlier January 2nd upon three months' notice being given by the company. The ordinary shares have recovered 5s. to 6½, upon the decision to pay off the debentures a year before the latest date to which they can run.

Miscellaneous Matters

British Electric Traction deferred ordinary stock, which rose 50 points last week, has gained a further similar amount, scoring a century in a fortnight. The reason for the rise is that mentioned some weeks ago, when the stock began to advance, namely, a demand based upon appreciation in prices of the stocks and shares in which the British Electric Traction Company is known to be interested. The 8 per cent. preferred ordinary is a point to the good at 163½.

The iron and steel market is quiet and rather uninteresting. Rubber shares have gone back in consequence of a fall in the raw produce, upon weakness in the American commodity markets.

Dollar Stocks

The annual meetings have now taken place of the Mexican Light & Power and the Mexico Tramways Companies. The chairman at each of these gatherings had a doleful task to perform, for he could hold out comparatively little hope for the companies so long as the conditions imposed by the Mexican Government remain as they now are. Mexican Light & Power first bonds have advanced 3 points to 38, and Mexico Tramways fives 2½ to 20. Brazilian Tractions, after providing an outstanding feature of strength amongst dollar stocks, reacted to their previous price of 11¾. Other Latin-Canadian issues are steady, without showing marked change.

A fortnight ago reference was made here to American-Canadian utilities as being "insecurities," a lapse into feeble flippancy which has evoked a protest from a holder of various bonds, *e.g.*, Montreal Tramways, Rio Tramways and Power Corporation of Canada, which obviously fall into the category more of investment than of speculation. Inclusion in his list of American-Canadian bonds of Tokyo Electric sixes provokes respectful wonder whether this investor is wholly serious in his protest.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Oct. 2.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	78/9	—	3 16 2
Brompton Ordinary	1	7	7	34/6	—	4 1 2
Charing Cross Ordinary	1	7	7	35/–	—	4 0 0
Chelsea	1	7	7	34/6	—	4 1 2
City of London	1	7½	7½	36/3	—	4 2 9
Clyde Valley	1	7	7	38/9	—	3 12 2
County of London	1	10½	10½	57/6	—	3 13 1
Edmundson's 7% Pref.	1	7	7	35/–	+6d.	4 0 0
Elec. Dis. Yorkshire	1	9	9	48/9	—	3 14 0
Elec. Supply Corporation ...	1	11	11	58/9	—	3 14 10
Kensington Ordinary	1	7	7	34/6	—	4 1 2
Lancs Light and Power	1	7	7½	37/6	—	4 0 0
London Electric	1	7	7	34/6	—	4 1 2
Metropolitan	1	10	10	53/9	—	3 14 6
Midland Counties	1	7	7	37/6	—	3 14 8
Mid. Elec. Power	1	8	8	43/9	—	3 13 2
North Eastern Electric Ordinary	1	6	6	33/–	—	3 12 10
Do. 7% Pref.	1	7	7	35/–	—	4 0 0
Northampton	1	10	10	53/9	+⅛	3 14 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 4
North Met. Elec. Ordinary ...	1	10	10	3⅛	+⅛	3 3 0
Do. do. 6% Pref.	1	6	6	32/–	+6d.	3 16 2
St. James' and Pall Mall ...	1	7	7½	36/6	—	4 2 2
Scottish Power	1	8	8	40/–	—	4 0 0
South London	1	7	7	35/–	–6d.	4 0 0
Westminster Ordinary	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/–	—	6 16 4
Yorkshire Elec.	1	8	8	46/3	—	3 9 1
PUBLIC BOARDS.						
Central Electricity, 1950–70 ...	Stock	5	5	115	—	4 7 0
Do. 1955–75 ...	,,	5	5	117	+1	4 5 6
Do. 1951–73 ...	,,	4½	4½	110	—	4 1 10
Do. 1963–93 ...	,,	—	3½	101	—	3 9 4
London & Home Counties, 1955–75	,,	4½	4½	110	—	4 1 10
London Passenger Transport, A...	,,	—	4½	121½	—	3 14 0
Do. do. B...	,,	—	5	126	—	3 19 4
Do. do. C...	,,	—	3	84	+2	3 11 5
West Midlands Joint Elec. 1948–68	,,	—	5	115	+2	4 7 0
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	112½	+1	8 0 0
Anglo-Am. Tel. Pref.	Stock	6	6	112	—	5 7 2
Do. Def.	,,	1½	1½	27½	+½	5 9 1
Cables & Wireless 5½% Pref. ...	,,	2¾	2¾	78	+½	3 10 6
Do. A. 7½% Ord.	,,	Nil	Nil	17½	–½	—
Do. B. Ord.	,,	Nil	Nil	8½	–¼	—
Globe Tel. and T. Ord.	10	Nil	2½	9½	—	2 10 8
Do. do. Pref.	10	6	6	12½	—	4 16 0
Great Northern Tel.	10	20	20	37	—	5 8 1
Marconi-Marine	1	10	7½	32/6	—	4 12 4
Oriental Telephone Ord.	1	12	12	3⅞	—	*3 15 3
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref. ...	5	Nil	Nil	1/6	—	—
Do. . do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	7½	—	—
British Electric Traction Df. Ord.	,,	5	5	785	+50	—
Do. do. Pref. Ord.	,,	8	8	163½	+1	4 17 10
Brazil Traction	100	—	—	11¾	—	—
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	105	—	4 15 3
Mexico Trams, 5% Bonds ...	—	5	5	20	+2½	—
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do 1st Bonds	—	5	5	38	+3	—
Victoria Falls Ord.	1	15	20	6½	+¼	3 1 6
Yorkshire (West Riding) ...	1	2½	5	25/–	—	4 0 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	10	3½	—	3 1 6
Assoc. Elec. Ord.	1	4	3	22/–	—	2 14 7
Do. Prf.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	9	6	43/6	+6d.	2 15 0
British Aluminium Ord.	1	5	5	29/6	+6d.	3 7 9
British Insulated Ord.	1	15	15	75/–	+1/6	4 0 0
Brush Ord.	Stock	Nil	Nil	45	+12	—
Callender's	1	15	15	3¾	—	4 12 4
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord. ...	5/–	22½	12½	27/6	—	2 5 6
Do. 8% Pref.	1	8	8	33/9	—	4 14 10
Edison-Swan 1st Pref.	1	7½	7½	22/6	—	6 13 4
Do. 5% Deb.	Stock	5	5	107½	—	4 13 0
Electric Construction	1	Nil	Nil	13/9	—	—
Enfield Cable Ord.	1	25	20	88/9	+⅛	4 10 1
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref.	1	Nil	Nil	11/3	—	—
Ever Ready	5/–	35	35	27/–	–6d.	6 9 8
Ferranti Pref.	1	7	7	28/–	+1/–	5 0 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	46/3	—	3 9 3
Henley's	1	30	30	6¾	+¼	4 4 0
Do. 4½% Pref.	5	4½	4½	5½	—	4 1 9
India-Rubber Preferred	1	—	—	1	—	—
Johnson & Phillips	1	5	5	29/6	+2/–	3 7 9
Siemens Ord.	1	6½	4	1	+⅛	4 0 0
Telegraph Construction	£1	Nil	Nil	1	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

1155. "Pressure-operated electric switch." C. L. Rees and G. R. Lush. March 6th, 1933. (416036.)

3752. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd., and A. A. Linsell. February 7th, 1933. (416047.)

6274. "Control gear for electrically driven vehicles." Leyland Motors, Ltd., and F. A. Garrett. March 1st, 1933. (416027.)

6306. "Electrolytic condensers." A. T. Pitt and Dubilier Condenser Co. (1925), Ltd. March 1st, 1933. (416049.)

6354. "Reversing and controlling of electric motors for toy locomotives, tramcars, and the like." H. Greenly. March 2nd, 1933. (416037.)

6444. "Apparatus for recording the duration of and other data relating to telephone calls." J. L Unwin and R. Unwin. March 3rd, 1933. (416029.)

6563. "Electrolytic condensers." Dubilier Condenser Co. (1925), Ltd. January 16th, 1933. (416010.)

6617. "Connection of flexible cables to electric couplings, lampholders, switches, and the like." J. A. Crabtree. March 4th, 1933. (416012.)

6634. "Electrically propelled vehicles with storage batteries." A. E. Morrison & Sons, Ltd., A. E. Morrison and A. C. Morrison. March 4th, 1933. (416042.)

6638. "Dynamo-electric generators." J. A. Kuyser and Associated Electrical Industries, Ltd. March 4th, 1933. (416015.)

6652. "Electron-emitting cathodes for electron-discharge devices." British Thomson-Houston Co., Ltd., and J. A. V. Fairbrother. March 4th, 1933. (416043.)

6677. "Electrolytic condensers with fuses." Elektrizitats-Akt.-Ges. Hydrawerk. March 5th, 1932. (416018.)

7176. "Electric heating elements for storage water-heaters and the like." H. A. Carney. March 9th, 1933. (416080.)

7314. "Dynamos for train-lighting installations." J. Stone & Co., Ltd., and A. H. Chilton. March 10th, 1933. (416088.)

7315. "Brush gear for dynamo-electric machines." J. Stone & Co., Ltd., and J. F. B. Vidal. March 10th, 1933. (416089.)

7563. "Automatic or semi-automatic telephone or like exchange systems." Standard Telephones & Cables, Ltd., E. P. G. Wright and J. R. Gould. March 13th, 1933. (416094.)

8254. "Portable electric lamps of the dry-battery type." F. J. Miller. March 18th, 1933. (416101.)

9085. "Electrically heated ovens and like chambers." C. R. Belling. March 25th, 1933. (416106.)

9575. "Thermionic valve assemblies and associated amplifying arrangements." W. A. Chambers and F. J. G. Cox. March 30th, 1933. (416109.)

11678. "Wireless direction-finding apparatus." E. V. Appleton, L. H. Bainbridge-Bell, J. F. Herd and R. A. W. Watt. April 21st, 1933. (416126.)

12483. "Wall boxes for electric switches, fuses, or the like." H. B. Prentice. April 29th, 1933. (416132.)

16937. "Electric irons." T. Winston. June 14th, 1933. (416152.)

16955. "Electrically operated chucks for machine tools." Sir A. Herbert, H. A. Lloyd, and C. H. Jinman. June 14th, 1933. (416153.)

17709. "Electric ovens and the like." L. W. Wild and Wild-Barfield Electric Furnaces, Ltd. June 21st, 1933. (416157.)

20882. "Electric arc lamps." A. H. Taylor and R. Heathcote. July 25th, 1933. (416170.)

22144. "Fireproof electric heater." J. Marxreiter. August 8th, 1933. (416174.)

22911. "Automatic volume-control systems suitable for use in radio receivers and like apparatus." Marconi's Wireless Telegraph Co., Ltd. August 20th, 1932. (416176.)

24309. "High-resistance alloys primarily for use in thermionic valve and like cathode cores." Marconi's Wireless Telegraph Co., Ltd. September 1st, 1932. (416186.)

28023. "Electric switch sockets." R. T. Waite. October 11th, 1933. (416195.)

31260. "Electric contact devices for operating direction indicators on motor vehicles." S. J. E. Asklund. November 10th, 1932. (416206.)

1934

1179. "Wireless receiving apparatus." C. Ripert. January 12th, 1934. (416239.)

1453. "Electromagnetically operated valves." British Thermostat Co., Ltd., and M. Payne. January 15th, 1934. (416244.)

1705. "Wireless navigation-aiding systems." Telefunken Ges für Drahtlose Telegraphie. January 17th, 1933. (416246.)

3140. "Electric discharge lamps." General Electric Co., Ltd. March 8th, 1933. (416062.)

4486. "Means for altering the timing of electrical impulses for the grid control of vapour-arc rectifiers." English Electric Co., Ltd., J. E. Calverley, and R. D. Ball. March 2nd, 1933. (Divided application on 6389/33.) (416021.)

9874. "Picture-assembling means for television and like apparatus." Suddeutsche Telefon-Apparate-Kabel-und Drahtwerke Akt.-Ges. June 27th, 1933. (416286.)

11780. "Filament holder for incandescent lamps." E. Staub. April 19th, 1934. (416289.)

12478. "Radio-receiving apparatus." W. Baggaly. April 25th, 1934. (Addition to 410225.) (416292.)

14190. "Dipole aerials." Marconi's Wireless Telegraph Co., Ltd. May 10th, 1933. (416296.)

15963. "Television and like apparatus." Fernseh Akt.-Ges. May 29th, 1933. (416298.)

18429. "High-frequency coupling elements." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 23rd, 1933. (416302.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 26th.

Javelin. No. 553059. Class 5. Unwrought and partly wrought metals in rod.—British Insulated Cables, Ltd., Prescot, Lancs.

Dyneto. No. 546248. Class 6. Electric generators, dynamos and motors.—Owen Dyneto Corporation, Syracuse, N.Y., U.S.A. (British representatives: Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, W.C.2).

Mini Mota (lettering and design). No. 552158. Class 6. Electric motors.—Edward G. E. Ford, 57, Eastwood Road, Goodmayes, Essex.

Jubilee. No. 553300. Class 8. Wireless receiving sets, combined wireless receiving apparatus and gramophones, and component parts thereof.—H. Clarke & Co. (Manchester), Ltd., Atlas Works, Patricroft, Manchester.

Synchrophone. No. 552614. Class 8. Radio receiving sets, &c.—Synchrophone, Ltd., 24, Berners Street, W.1.

Synchromatic. No. 549656. Class 10. Clocks.—Synchromatic Time Recording Co., Ltd., 47, South Castle Street, Liverpool.

Excelda. No. 552193. Class 13. Electric soldering irons.—H. H. Williams, Ltd., 79, Queen Victoria Street, E.C.4.

Consec. No. 552258. Class 13. Electric switches (ordinary).—Kins' (Kent), Ltd., 3, Red Lion Square, Whitstable, Kent.

Belgian Foreign Electrical Trade

THE following table shows the Belgian imports and exports of electrical machinery, apparatus, and cognate goods during the first half of the current year as compared with the corresponding six months of 1933, the values having been converted at an exchange rate of 125 fr. to the £. Taking the figures as given in the Belgian official returns lately issued, it will be seen that there has been a further decrease in both the imports and exports:

	Imports. Jan.-June, 1933.	1934.	Exports. Jan.-June, 1933.	1934.
	£	£	£	£
Dynamo-electric machinery ...	175,336	145,360	58,096	108,328
Dry batteries	9,136	8,848	816	592
Accumulators and parts ...	13,024	8,832	10,800	9,312
Magnets, other than electro-magnets	3,160	1,896	8	320
Land and submarine cables ...	5,072	3,176	67,344	84,184
Insulated wires and cables ...	26,208	28,576	84,240	84,112
Carbons and electrodes ...	19,176	17,256	968	88
Porcelain insulators	15,072	8,752	1,432	808
Electric globes, bulbs, and glassware	23,200	22,560	7,024	13,232
Insulating tubes, junction boxes, &c.	13,216	12,704	8,264	8,368
Other insulating material ...	18,960	12,472	552	688
Arc lamps	4,896	712	40	32
Incandescent lamps	81,544	64,712	41,776	36,680
Radio valves	57,568	66,504	—	1,224
Electric measuring instruments	73,904	75,312	3,848	4,624
Telegraphic and telephonic apparatus	20,088	11,760	164,823	127,520
Radio sets and apparatus ...	312,904	186,160	18,168	13,456
Other electrical apparatus ...	410,128	399,672	90,584	63,816
Totals	£1,282,592	£1,075,264	£558,783	£557,384

An analysis of the import figures shows that the bulk of the electrical machinery was supplied by Germany, with smaller quantities from France, Sweden, Holland, Switzerland, the United States and Gt. Britain in that order. The dry batteries came chiefly from Denmark and Germany and the accumulators mainly from Gt. Britain, the United States, and Germany. The last-named country also supplied the major portion of the land and submarine cables, and also the bulk of the insulated wire and cables, followed by Switzerland, Holland, Gt. Britain and France. France supplied the major portion of the electrodes, followed by the United States, Germany, and Switzerland. The bulk of the insulators also came from France with Germany in the second place.

Practically the whole of the electric lamps are credited to Holland, while Germany controls the bulk of the trade in insulating tubes and junction boxes. In the order of their importance, the chief suppliers of incandescent lamps were: Holland, Hungary, Germany, and France, while as regards radio valves Holland leads, followed by the United States, Gt. Britain and Germany. The electrical measuring instruments came principally from Switzerland, and Germany, and the telegraphic and telephonic apparatus from Germany, Gt. Britain, France, the United States and Holland. To Holland falls the bulk of the imports of radio sets and material, Germany, the United States and Gt. Britain following in that order.

Of the unclassified electrical apparatus, Germany is by far the most important, followed by France, the United States, Sweden, Holland, Gt. Britain and Switzerland.

On the export side Argentina, Egypt, the Belgian Congo, and Holland were the largest buyers of Belgian electrical machinery. Holland took the major portion of the dry batteries and the Belgian Congo most of the accumulators, and Gt. Britain, Germany, Egypt, and India of the cables. By far the largest market for Belgian insulated wire was Gt. Britain, followed by South Africa, Holland, and Sweden. Gt. Britain was also the largest buyer of Belgian incandescent lamp bulbs, while for telegraphic and telephonic instruments and apparatus the best markets were Brazil, Spain, Holland, and Italy. As regards unclassified electrical apparatus, the largest quantities were taken by France, Switzerland, Uruguay, the Belgian Congo, and Egypt.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (246), Tate Works site; T. F. Henderson, burgh surveyor, Town House.

Bebington.—Houses (200), Spital; Evans & Williams, builders, 63, Aspden Grove, Wavertree, Liverpool.

Bedford.—School, London Road (£33,000); Louis de Soissons, architect.

Berwick-on-Tweed.—Houses (100); borough engineer.

Birmingham.—Cinema, Kingstanding Road, near Oscott Hill; Mr. Rogers, Birmingham Road, Wylde Green.

Brierley Hill.—Houses (88), Wordsley; J. F. Hughes, Ltd., builders, Lichfield Street, Wolverhampton.

Brighton.—School, Warmdene Avenue (£15,500), for E.C.

Bromsgrove.—Houses (100); U.D.C. surveyor.

Burton-on-Trent.—Cinema for the Picturedrome Co.; Thomas Lowe & Sons, builders.

Cardiff.—Houses (100), Tremorfa and Ely Estates; city engineer.

Carlisle.—Church, on the Corporation's Housing Estate, Raffles; Seely & Paget, architects, 41, Cloth Fair, Smithfield, London, E.C.1. Extensions to Girls' High School for E.C.; P. Dalton, city architect, Town Hall.

Chelmsford.—Staff cottages, Severels Mental Hospital (£18,335); E. A. Cook & Sons. Cinema, Baddow Road; Ritz (Chelmsford), Ltd. Works extensions, Broomfield Chase; Hoffmann Manufacturing Co., Ltd.

Cheshire.—Primary school (400 places), Timperley, for County E.C.; director of education, Stafford.

Chester-le-Street.—Houses (100); W. Ridley, surveyor, Council Offices.

Cumnock.—Houses (164), Herdstone Place; burgh surveyor.

Derby.—Police buildings (£48,995); Ford & Weston, builders.

Doncaster.—School, Wheatley Park (£23,686), for Borough E.C.; Frank Haslam, Ltd., builders.

Dudley.—Houses (200), Foxyards Estate (£55,999); Henry Boot & Son, Ltd. Schools, Blower's Green (£11,112), for Borough E.C.; W. Kendrick & Sons, Ltd., builders, Walsall.

Dumfries.—Houses (100), Nithside; burgh surveyor.

Durham.—Central Poor Law Hospital, Dryburn (£240,000), for County P.A.C.

Eastbourne.—Houses, Beachlands Estate and Polegate Stud Farm Estate; Estate Co. Aerodrome; borough engineer. School (£7,570); Rice & Son, Ltd.

Eccles.—Houses (30), Napier Road, Monton; W. H. Fletcher, builder, Gore Bank, Gore Crescent, Seedley, Salford.

Edinburgh.—Five years' housing programme (250 each year); burgh surveyor.

Elgin.—Houses (60), Kingsmills; A. A. Tarriff, burgh surveyor, Town House.

Enfield.—Houses (28), Lincolnway; J. Neilson. Houses (103), London Road; C. L. Ward, c/o Smith Bros. Additions to Enfield Cable Works, Hillmarsh Lane; Griggs & Son. Factory extensions, Southbury Road; Belling & Co. Works extensions, High Street, Ponders End; Arlington Motor Co.

Essex.—Boys' secondary school for Woodford, Buckhurst Hill, and technical college, Longbridge Road, Barking (£131,270), for County E.C. Senior school, Rayleigh (£32,345), and extensions to Havering Road School, Romford (£14,500); county architect, Chelmsford.

Eston (YORKS).—Houses (348); U.D.C. surveyor.

Feltham.—Houses (68), Faggs Road; J. P. Blake, architect, 214, High Street, Hounslow.

Fife.—Houses (163), McDuff, East Wemyss; G. Sandilands, Education Offices, Kirkcaldy.

Filey.—Houses (250), Muston Road; U.D.C. surveyor.

Flaxton.—Houses (176) and flats, Huntingdon Road; York borough engineer.

Frome.—Houses (30); F. H. Biddiscombe, Trowbridge, and J. V. Lear, Trowbridge, builders.

Glasgow.—Houses (136), Hillington Park; housing director. 20, Trongate. Extension to Eye Infirmary (£25,000); Mr. Tait of Sir John Burnet, Tait & Lorne, architects.

Greenock.—Houses (2,363); R. Millar, burgh surveyor, Municipal Buildings.

Guildford.—Houses (100), Bannister's Farm, Onslow Village, H. Ashenden.

Hanley.—Cinema, on site of the Grand Theatre (£50,000); A. Cotton, Son & Hulme, architects, Piccadilly, Tunstall, Staffs.

Haslemere.—Houses, Hindhead; A. J. Stedman, architect, Farnham.

Hastings.—Public convenience (electrical work), West Marina Gardens; S. Little, borough engineer, 37, Wellington Square.

Henley.—Houses (67), Union Meadow; Building and Public Works Co., Swindon.

Holywell.—Houses (50); J. Davies, builder, Bodfar.

Irish Free State.—(SWINFORD, Co. MAYO).—Fever hospital, for the Mayo Board of Health, of County Home, Castlebar; P. J. Munden, chartered architect, 1, South Frederick Street, Dublin.

Kidderminster.—Houses (80), Foley Park Estate; borough surveyor.

Kinver.—Houses, Dunsley; T. W. Edwards & Sons, Audnam, Stourbridge.

Lanarkshire.—Houses (88), Carstairs and Bargeddie (electrical work). for C.C.; P. C. Smith, housing engineer, 13, Clydesdale Street, Hamilton.

Leeds.—Houses (982) and flats (£275,030); Industrial Builders, Ltd., Croydon.

London.—(BERMONDSEY).—Fifty flats, Southwark Park Road and Aylton Street; borough engineer. (CATFORD).—Shops and flats, Catford Hill; W. R. Hindmarsh. (FOREST HILL).—Telephone exhange for H.M. Office of Works. (HACKNEY).—Baths, Gainsborough Road (£22,382); Commercial Structures, Ltd. Tenements, Banister Street, and Newcombe House extension (£8,000); borough engineer and trade contractors. Town hall (£104,975); Dove Bros., Ltd., Islington. (HAMMERSMITH).—Block of flats, Shepherd's Bush Green; H. V. Kerr. Buildings, King's Court; R. J. H. Minty. Buildings, Shepherd's Bush Road and Rocklet Road; Sir Aston Webb & Son. Tenements, Becklow Road (£50,000); borough engineer. Extensions to Latymer Foundation School, Hammersmith Road; Governors. (PADDINGTON).—Houses, 29-31, Porchester Terrace; W. E. Masters. Canopy for Grand Cinema, Great Western Road; T. Smith Shearer. (ST. PANCRAS).—School, Holmes Road; Roman Catholic Authorities. (SOUTHGATE).—Houses (133), Lakenheath Road, &c.; J. Neilson. Houses (40), Springfield Nursery Estate, Avenue Road; H. A. Nash. Houses (98), Telford Road; J. M. Webster. Community hall, Addison Avenue (£5,000); borough engineer. (WOOD GREEN).—Factory reconstruction, Bounds Green Road; Standard Bottle Co., Ltd., Town Hall, extension; C. H. James, architect.

Luton.—Extensions, Maidenhall school (£8,934), for E.C.; S. Foster, Ltd., builders.

Maidenhead.—Houses (30), Blackamoor Lane, for S. W. Harmer.

Manchester.—Houses (£452,765); borough engineer. Shops, Sale Road; C. H. Normanton & Son, Ltd. Town Hall extensions; borough engineer.

Mansfield.—Houses (80), Mayfair Avenue, &c.; Heathcote Estate (Whitton), Ltd.

Merthyr Tydfil.—Houses under slum clearance scheme (£50,000); borough surveyor.

Monifieth (ANGUS).—Church, Panmore Street (£4,000); T. Lindsay Gray, 2, India Buildings, Dundee.

Morecambe.—Houses (100), Great Wood Estate; J. H. Atkinson.

Newcastle-on-Tyne.—Factory for Northern Counties School Furnishing Co.; Cackett, Burns, Dick & McKellar, architects, 26, Ellison Place.

Newhaven.—Houses (24), King's Avenue, for Bertram & Curtis.

Northampton.—Houses (62), Bush Hill; T. Wilson & Son, Ltd. Houses, St. David's site; Bainbridge (Builders), Ltd. Cinema, Main Road; W. Harris.

Northfleet.—Houses (46), Waterdales; U.D.C. surveyor.

Oxford.—Theatre, Gloucester Green (£30,000); Union Theatres (Oxford), Ltd. Additions to works, Woodstock Road; Morris Motors, Ltd.

Patcham.—Houses (32), Dyke Road Estate; T. G. Thompson. Public hall and 28 houses, Ladies Mile Estate; Ladies Mile Estate, Ltd.

Petersfield (HANTS).—Houses (26), Keydell Avenue, Horndean, for G. Marsh.

Preston.—Public baths (£50,000); Thomas Croft & Sons, Ltd., builders.

Ramsgate.—Development of the Marine, with cafés, &c. (£30,000); Tomson & Wotton, Ltd.

Rawtenstall.—Houses (52); borough surveyor.

Romford.—Institution extensions (£8,570); F. R. Hipperson & Son.

Saltcoats.—Houses, Rocky Park; G. Harley, burgh surveyor, Kyleshill.

Seaham.—Houses (100); J. B. Abbey, U.D.C., borough engineer.

Sedgeley.—Houses, Lower Gornal; T. Alwyn Lloyd, architect, Cardiff.

Sheffield.—Rebuilding factory, Hermitage Street, Cooper & Sons (Sheffield), Ltd.; Dyson & Co., builders, 13, Aixlewood Road. Houses (349), Arbourthorpe Estate; borough engineer. Houses (100), for J. G. Graves Charitable Trust; secretary. Houses (16), Herries Road; M. Bonner. Houses (18), Hucklow Road and Rutland Road; C. W. Alflat. School, Woodthorpe Road; borough engineer.

Shipley.—Houses (28), Low Ash Estate; Walton Bros. Houses (20), Poplar Avenue; Dale & Wild. Houses (20), Westfield Grove; A. Dickinson. School, Baker Street (£6,176), for E.C. Works extension, Hirst Wood Road; Wigglesworth & Co., Ltd.

Slough.—Houses (60), Stoke Poges Lane; H. Street & Co.

Smethwick.—Works extensions, Cape Hill; Mansill, Booth & Co., Ltd. Works extensions, Dartmouth Road; Henry Hope & Sons, Ltd. Works extensions, Rabone Lane; I.C.I. Metals, Ltd.

Southport.—Schools, Church Town, for R.C. Managers; priest-in-charge. Extensions to King George V School, including manual and gymnasium block, for Borough E.C.; director of education.

Springhead (LANCS).—Houses (30), Cooper Street; H. Winder, architect, Oldham.

Stevenson (AYRSHIRE).—Houses (150), £51,828; W. Reed, 14, Wellington Square, Ayr.

Stirlingshire.—School, Raploch (£17,000), for C.C.; county architect.

Stockton-on-Tees.—Secondary school (£92,000), for Borough E.C.; director of education.

Stranraer.—Creamery for the Scottish Milk Marketing Board (£10,000); J. Mercer, Municipal Buildings.

Sunderland.—Cinema and shops (£17,000), north side of Sea Road, Fulwell; W. Rutherford, Fulwell.

Surbiton.—Houses (42), Rose Walk; H. C. Jones & Co. (Surrey), Ltd.

Tadcaster.—Houses, East Tadcaster (£12,110); J. H. Gilbert, builder, Doncaster.

Teddington.—Houses, Broom Road; Kenley Claremont Building Co., Ltd. Shops and flats, Staines Road; Marshall & Tweedy. Theatre, &c., Broom Road; Warner Bros.

Torquay.—Houses (24), Elm Grove; M. R. Fletcher.

Worcestershire.—Senior Council School, Stourport; director of education, Worcester.

York.—Houses (31), Bishopthorpe Road; A. Temple. Houses (48), Garfield Terrace; Metcalf & Jowitt.